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# A COMPARISON OF THE SCIENCE BACKGROUND OF ELEMENTARY TEACHERS-IN-TRAINING AT THE UNIVERSITY OF ALBERTA, CALGARY AND THE UNIVERSITY OF ILLINOIS

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Comparisons between the products of two different educational systems are difficult and University of Alberta education students are as a group, both products of and prospective teachers for Canadian schools, not those of the United States. However when, as is true in elementary science in Alberta, objectives, course outlines, textbooks, other instructional materials, and recommended teaching procedures in one system are taken over almost intact from another country then it becomes important to attempt such comparisons. Any course of study implies certain expectations of the teachers who are to implement that course. If there is any doubt that such expectations are realistic, that they can be met by the teaching personnel available, the wisdom of adopting such a course of study is questionable.

Although standards vary widely even within a single state in the United States, the present Alberta course of study in elementary school science would probably be regarded as a "good" demanding course by most U.S. school people. If such a course were adopted by an Illinois school or school system and taught by a recently certified graduate of the University of Illinois College of Education, this teacher would have the following qualifications: (1) A B.Ed. degree in elementary education, (2) sixteen semester hours in science courses at the university level, (3) possibly a course in science methods although this is offered on an elective basis and is not required for certification.

When this course is taught by a recently certified student of the University of Alberta, the teacher would have the following preparation, depending on the certificate: (1) If holding a Junior Elementary certificate, no courses in science at the university level and a half course in education which combines methodology and a survey of the content to be taught. (2) If holding a Standard Elementary certificate, one university course in science (physical geography for the group in this study) and a half course in science education with some review of the science to be taught. (3) If holding a Standard Secondary certificate, preparation would vary with the major and minor field.

Specifically the contrast between the holder of a B.Ed. degree including two years of university science and the holder of a Junior Elementary certificate with no work in science at the university level suggests the possibility that what might be a reasonable expectation for the first teacher would be quite unreasonable for the second.

## The Problem

This paper is an attempt to make more exact comparisons of the science background of the two groups of teachers in regard to (a) scores on an achievement test in general science and (b) a closer examination of course work in high school and university.

## Subjects

The sample from the University of Illinois is the small group (23 students) taking the methods course in elementary science in the spring semester of 1957.[1]

This may be a biased sample in that registration for this course is voluntary. Students presumably might elect such a course because they felt weak in the area and desired further preparation before teaching, because they were interested in science and preferred a methods course in this field to other electives, or for a variety of trivial reasons. It is not known which of these motives caused students to register—or even if they cancelled out and gave what is, in effect, an unbiased sample.

The sample from the University of Alberta, Calgary is the groups registered for Education 229 (Junior Elementary Science Methods) and 286 (B.Ed. Elementary Science Methods) during the 1961-62 term.

## Measuring Instruments and Procedure

The instrument used to measure knowledge of science was the Read General Science Test.

This is recognized as an adequate achievement test for general science but there is some question of its validity for this level. It was designed for and standardized on U.S. high school students completing 9th grade general science. Forty per cent of the questions are from the area of physics, which reflects the test's original purpose and the attention given this subject in general science courses, but is an over-emphasis in terms of elementary school science.

Two rough estimates of the validity of this instrument have been obtained.

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[1]Data are adapted from Priscilla J. Eccles. "An Evaluation of a Course in Teaching Science in the Elementary School". Unpublished Doctoral Thesis, University of Illinois, 1958.

One was a comparison of the achievement of the Junior Elementary group with that of a group of students in the B.Ed. after B.A. program at the University of Alberta, Calgary who are enrolled in the secondary science methods course. The majority of these students have strong science backgrounds. The results are given in Table I.

TABLE I

COMPARISON OF ACHIEVEMENT ON READ GENERAL SCIENCE TEST BY UNIVERSITY OF ALBERTA, CALGARY STUDENTS HOLDING B.S. OR B.A. DEGREES (ED. 480S) AND STUDENTS IN JUNIOR ELEMENTARY SCIENCE METHODS COURSE (ED. 229)

| Subjects | n | Mean | S.D. | Range (75 items) |
|---|---|---|---|---|
| Ed. 480S | 27 | 64.03 | 5.06 | 45-73 |
| Ed. 229 | 125 | 55.5 | 6.73 | 40-69 |
| | | 8.53* | | |

*t test indicates difference between means is significinat at 5% level.

The test does appear to measure gross differences in subject matter background. It is also encouraging that not even in the advanced group did any individual answer all the questions correctly.

A comparison was also made between the scores of the B.Ed. Elementary group and scores made by the same group on the Iowa Tests of Educational Development, Test II, Background in the Natural Sciences. This test has been designed for use through grade 12, and examination of the individual items also leads to the conclusion that it is less specific to a particular course (9th grade general science) than is the Read Test. The product-moment coefficient of correlation between the Read Test and the Iowa Test was .62.

With the reservations noted, it seems reasonable to assume that group scores on this test do give a crude but valid estimate of the command of the subject matter of elementary school science.

For all subjects the achievement test was given near the beginning of the methods course. The information concerning high school preparation was taken from questionnaires filled out by the students rather than from official records and may therefore be subject to minor inaccuracies.

## Test Results

TABLE II

ACHIEVEMENT ON READ GENERAL SCIENCE TEST: UNIVERSITY OF ALBERTA, CALGARY JUNIOR ELEMENTARY STUDENTS (ED. 229) AND UNIVERSITY OF ILLINOIS B.ED. ELEMENTARY STUDENTS ED. 332)

| Subjects | n | Mean raw Score: 75 items | S.D. |
|---|---|---|---|
| Ed. 229—U.A.C. | 125 | 55.5 | 6.73 |
| Ed. 332—U. of I. | 23 | 55.22 | 7.53 |
| | | .28[1] | |

[1]t test indicates difference in means is *not* significant.

TABLE III

ACHIEVEMENT ON READ GENERAL SCIENCE TEST: UNIVERSITY OF ALBERTA, CALGARY JUNIOR ELEMENTARY STUDENTS (ED. 229) AND UNIVERSITY OF ALBERTA, CALGARY B.ED. ELEMENTARY STUDENTS (ED. 286)

| Subjects | n | Mean raw Score: 75 items | S.D. |
|---|---|---|---|
| Ed. 229 | 127 | 55.5 | 6.73 |
| Ed. 286 | 40 | 55.97 | 6.01 |
| | | .47[1] | |

[1]t test indicates difference is *not* significant at 5% level.

TABLE IV

ACHIEVEMENT ON READ GENERAL SCIENCE TEST: UNIVERSITY OF ALBERTA, CALGARY B.ED. ELEMENTARY STUDENTS AND UNIVERSITY OF ILLINOIS B.ED. ELEMENTARY STUDENTS

| Subjects | n | Mean raw Score: 75 items | S.D. |
|---|---|---|---|
| U.A.C. | 40 | 55.97 | 6.01 |
| U. of I. | 23 | 55.22 | 7.53 |
| | | .75[1] | |

[1]t test indicates difference is *not* significant at 5% level.

The results given above do not confirm expectations of superior achievement for students with one or two years of university science.

## Science Courses

### TABLE V
### HIGH SCHOOL AND UNIVERSITY SCIENCE COURSES: RECENT GRADUATES OF ALBERTA HIGH SCHOOLS

A: Junior elementary students, University of Alberta, Calgary

| | Courses | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| n | Sci 9 | Sci 10 | Sci 20 | Biol 32 | Chem 30 | Phys 30 | University Courses | Total |
| 1 | x | x | x | | x | x | 3 | 8 |
| 1 | x | x | x | x | x | | 1 | 6 |
| 3 | x | x | x | x | x | x | | 6 |
| 54 | x | x | x | x | x | | | 5 |
| 11 | x | x | x | | x | x | | 5 |
| 4 | x | x | x | x | | x | | 5 |
| 3 | x | x | x | x | | | | 4 |
| 2 | x | x | x | | x | | | 4 |
| 1 | x | | x | | x | x | | 4 |
| 1 | | x | x | x | x | | | 4 |
| 1 | | | x | x | x | | | 3 |
| 1 | x | | | x | | | | 2 |
| B: B.Ed. elementary students, University of Alberta, Calgary | | | | | | | | |
| 1 | x | x | x | x | x | x | 3 | 8 |
| 1 | x | x | x | x | x | x | 1 | 7 |
| 17 | x | x | x | x | x | | 1 | 6 |
| 1 | x | x | x | | x | x | 1 | 6 |

### TABLE VI
### HIGH SCHOOL AND UNIVERSITY COURSES: STUDENTS WHO WROTE RECENT ALBERTA MATRICULATION EXAMINATION BUT DID NOT FOLLOW STANDARD CURRENT ALBERTA HIGH SCHOOL PROGRAM

A: Junior elementary students, University of Alberta, Calgary

| | Grades | | | Courses | | | | |
|---|---|---|---|---|---|---|---|---|
| n | 9 | 10 | 11 | Biol 32 | Chem 30 | Phys 30 | University Courses | Total |
| 1 | x | x | x | x | x | x | | 6 |
| 1 | x | x | x | x | x | | | 5 |
| 2 | x | x | | x | | x | | 5 |
| 1 | x | x | x | x | | | | 4 |
| 1 | x | x | | x | | x | | 4 |
| 2 | | | | | | | | |
| 1 | | | | | | | | |
| 1 | | | | | | | | |
| 2 | est. 2 years European secondary | | | x | x | | | |
| B: B.Ed. elementary students, University of Alberta, Calgary | | | | | | | | |
| 1 | x | x | 2 | | x | x | 1 | 7 |
| 1 | x | x | x | x | x | x | 1 | 7 |
| 3 | x | x | x | x | x | | 1 | 6 |

## TABLE VII

## HIGH SCHOOL AND UNIVERSITY COURSES: STUDENTS WHOSE HIGH SCHOOL WORK WAS DONE OUTSIDE PROVINCE—OR AT SUCH AN EARLY DATE THAT PRESENT MATRICULATION COURSES NUMBERS ARE NOT APPLICABLE

A: Junior elementary students, University of Alberta, Calgary

| | Grade | | | | | | |
|---|---|---|---|---|---|---|---|
| n | 9 | 10 | 11 | 12 | 13 | University Courses | Total |
| 1 | | 1 | 2 | 3 | | 3 | 9 |
| 2 | 1 | 1 | 2 | 3 | | | 7 |
| 4 | 1 | 1 | 2 | 2 | | | 6 |
| 7 | 1 | 1 | 1 | 2 | | | 5 |
| 3 | 1 | 1 | 1 | 1 | 1 | | 5 |
| 1 | 1 | 2 | 1 | 1 | | | 5 |
| 1 | est. number of years, European secondary | | | | (5) | | 5 |
| 1 | ½ | 1 | 1 | 1 | 1 | | 4.5 |
| 1 | 1 | 1 | 1 | 1 | | | 4 |
| 1 | est. number of years, European secondary | | | | (2) | 2 | 4 |

B: B.Ed. elementary students, University of Alberta, Caglary

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 2 | 2 | | 1 | 7 |
| 1 | 1 | 2 | 1 | 2 | | 1 | 7 |
| 1 | 1 | 1 | 1 | 2 | | 1 | 6 |
| 1 | 1 | 1 | | 1 | | 1.5 | 4.5* |
| 1 | 1 | 1 | | | | 1 | 3 * |

*transfer students from U.S.

## TABLE VIII

## HIGH SCHOOL AND UNIVERSITY COURSES: UNIVERSITY OF ILLINOIS B.ED. ELEMENTARY STUDENTS

| | Courses | | | | | Years of University | |
|---|---|---|---|---|---|---|---|
| n | Sci | Biol | Chem | Phys | Other | Science | Total |
| 2 | x | x | x | x | | 2 | 6 |
| 5 | x | x | x | | | 2 | 5 |
| 1 | x | | | | x | 2 | 5 |
| 7 | x | x | | | | 2 | 4 |
| 1 | | x | | | x | 2 | 4 |
| 2 | x | | x | | | 2 | 4 |
| 1 | | x | x | | | 2 | 4 |
| 2 | x | | | | | 2 | 4 |

TABLE IX

SUMMARY: COURSE WORK IN SCIENCE, ELEMENTARY TEACHERS-IN-TRAINING, UNIVERSITY OF ALBERTA, CALGARY AND UNIVERSITY OF ILLINOIS

| U.A.C. B.Ed. Elem. | | U.A.C. J. Elem. | | U. of Ill. B.Ed. Elem. | |
|---|---|---|---|---|---|
| n | Total No. of Years | n | Total No. of Years | n | Total No. of Years |
| | | 1 | 9 | | |
| 1 | 8 | 1 | 8 | | |
| 5 | 7 | 2 | 7 | | |
| 22 | 6 | 9 | 6 | 2 | 6 |
| | | 84 | 5 | 6 | 5 |
| 1 | 4.5 | 1 | 4.5 | | |
| | | 13 | 4 | 11 | 4 |
| 1 | 3 | 5 | 3 | 2 | 3 |
| | | 1 | 2 | | |
| Mean: 6.08 | | Mean: 4.9 | | Mean: 4.38 | |

The above table is distorted by (a) considering high school and university courses as equivalent in determining totals, since presumably a university course is taught in greater breadth and depth and (b) equating two semesters in a U.S. university with one term in a Canadian, although it seems likely that a semester course, while less thorough than a term course, is more than a half course. Both distortions tend to over-emphasize the difference between the preparation in science of U.S. and Alberta teachers.

## Discussion

Comparison of results on the Read General Science Test and of the course work in high school and university suggests that the difference in science background between teachers-in-training at the University of Illinois and the University of Alberta, Calgary is negligible.

This could be considered more a cause for dissatisfaction among those responsible for training and certification of teachers in the State of Illinois than a cause of satisfaction for those with similar responsibilities in Alberta. In particular the results and other, more subjective data, from the original Illinois study raise questions concerning the quality of the university science courses required of these students who seem to be failing to achieve a level of understanding that would result in the ability to retain and apply principles.

Alberta B.Ed. Elementary students do appear to have an advantage in course work although this is not reflected in an increased

score on the Read test. This could be considered a result of using an inadequate measuring instrument and no inquires were made concerning content and quality of the science course taken. In all but one case the course was physical geography. An examination of individual items on the test indicates that approximately 12 of the 75 questions could have been covered in such a course.

In so far as teaching ability is affected by knowledge of subject matter, it would appear sensible to make similar demands of all three groups in terms of content to be taught and teaching techniques to be employed. On the other hand it may be true that new courses of study in elementary science require a subject matter mastery beyond that exhibited by any of these three groups of prospective teachers. An examination of the test items on the Read General Science Test leads to the opinion that almost complete mastery of science to this level would be required to teach the new courses competently.

No research is at present available as to the degree of subject matter mastery necessary to teach elementary science or as to the effect of inadequate understanding on the quality of teaching and pupil achievement. The author hopes that a study now in the planning stage will make possible some tentative answers to these questions.

# CHARACTERISTICS OF STUDENTS WHO FAILED GRADE SEVEN IN EDMONTON JUNIOR HIGH SCHOOLS, 1951-52

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## The Problem

The purpose of this investigation was to make a thorough study of the student who fails, by particular reference to four areas:

1. Teachers' ratings.
2. Environmental factors.
3. Achievement and ability.
4. Academic record.

The population of the study was made up of the 212 failures in grade seven during the years 1951 and 1952 in the Edmonton Public School system. Grade seven was chosen as the focal point of the study for three main reasons:

1. The prior educational progress of these students could be assessed.

2. The post grade seven school achievement of these pupils could be evaluated.

3. Grade seven is the mid-point on the educational ladder toward a high school diploma.

The years 1951 and 1952 were chosen particularly so that by 1959, the year of the study, the students under consideration would have had sufficient time to complete their education.

It was hoped to find partial answers to questions such as these: What influence did the student's health have on his school progress? What is the relationship between failure and the father's occupation? What is the relationship between age at grade seven failure and the I.Q.? What is the relationship between age at grade seven and drop-outs from the city system? What is the relationship between a pupil's age at grade seven failure and his achievement prior to grade seven? What is the relationship between achievement prior to grade seven and drop-outs from the city system? What are the probable chances of a grade seven failure completing high school? Should provision be made for other than regular classroom instruction for students who fail? Are these failing students merely biding their time until they reach the legal leaving age of fifteen so they may drop out of school?

## Survey of the Related Literature

In general the related literature supports three generalizations:

1. The present grade system for class grouping is most unsatisfactory.

2. Social promotion, progress at the pupil's maximum rate, and streaming are devices used to circumvent the objections to the rigid grade system.

3. Pupils must be dealt with individually. Each child has different rates of learning and growth from every other child. The duty of the school is to insure the maximum development of each child's potential ability.

## Literature on Promotional Practice

The related literature takes two divergent views. The first is that our present lock-step grade system is outmoded and should be replaced; the second is that there is nothing wrong wtih the grade system and present promotional practices will work provided the non-promoted child receives the individual attention he deserves.

Those authorities opposed to the graded curriculum state that the idea of individual difference is not recognized. Pupils at any grade level have a wide variation in ability. This difference, as Cook (9) notes, is present in grade one where there may be a spread of as much as four years in mental age. Dunlop (11), in a recent study, points out the wide range of abilities present in every classroom and stresses that teaching must be as individualized as possible. Within the grade framework enthusiastic teachers, small classes and systematic testing are needed for the slow learner.

Social promotion has its critics. Barlow (4) states that promotion loses its meaning unless it is earned and children under such a plan can become completely out-of-step with the school's programme. In support of Barlow, others like Anfinson (2) are not convinced that non-promotion is responsible for maladjustment to the schoolroom situation that is attributed to it.

Goodland (16) states that there is no panacea for taking care of the difficult problem of promotion or non-promotion. His study indicates that repeaters generally show a consistent pattern of undesirable growth characteristics and unsatisfactory school progress.

Hadley (17) points out that promotion to be significant must be based on marks that are meaningful. He is convinced that too subjective factors enter into the gradings assigned. Durost (12) supports this view by stating that teachers are indaquately trained to properly construct, administer or interpret test results. Carrothers

(7) carries this further and states that one failing of the school is its inability to measure adaquately the increase in educational growth or show the public that educational growth has been made.

### School Drop-Outs

School systems are much concerned with the drop-out problem. It would seem logical to assume that there is a close relationship between school failure and drop-out. The student who is met with frustration, lack of success, and is negativistic in his attitude toward school is a potential drop-out. There has been too much idealistic talk of retaining all pupils in school. The general public are inclined to think that remaining in school and education are synonymous. Byrne (6) states flatly that it is neither desirable nor possible to retain all students in high school until graduation, but it may be possible to retain a larger portion of them by a better understanding of them and their problems.

### Sources of the Data

The data for the study were made available by the Edmonton Public School Board. This material was supplemented by reference to the files of the Provincial Department of Education. From the promotion sheets of all grade seven pupils in the years 1951 and 1952 the names of those pupils who had failed were listed. Altogether 212 cumulative record cards of failing students were examined and pertinent data recorded. To serve as a basis of comparison with the study sample a reference sample of 212 cumulative record cards was drawn from the files at the Edmonton Public School Board offices. From sixty-five hundred alphabetically arranged cards, every thirtieth card was drawn until 212 were in the sample. While this method did not provide a true random sample, it was considered that any bias in sampling introduced by the method would be negligible. It was believed that a basis of comparison would be helpful in four areas: with reference to the Laycock Mental Ability Test because statistics were lacking with respect to the normal distribution of scores of city pupils; with respect to fathers' or guardians' occupations; with reference to home status; and particularly with reference to the teachers' ratings on the six areas of personality development. The significance of the differences between the study sample and the reference sample was tested by $\chi^2$ in each of the four areas mentioned above.

A careful study of the cumulative record cards revealed pertinent information that could be used to advantage in assessing these grade seven failures. The cumulative record card was supplemented by a separate attendance and progress card which included the

medical history of each child. The data from each student's set of cards were duly noted on summary data sheets under eighteen main headings. These larger headings were subdivided into as many as eleven subdivisions. This information was then coded on International Business Machine cards for analysis.

The data on the students' cards were divided into three main areas:

1. Pre grade seven.
2. Grade seven.
3. Post grade seven.

In addition the following study sample data were tabulated as contingency tables and tested for the existence of pertinent relationships using the $\chi^2$ test.

1. The age at grade seven failure and the intelligence quotient.
2. The age at grade seven failure and the achievement prior to grade seven.
3. The age at grade seven failure and the drop-outs from the city system.
4. The father's or guardian's occupation and the intelligence quotient of the child.
5. The achievements of the repeated year in grade seven and drop-outs from the city system.

## Pre Grade Seven Study

To deal effectively with this particular area of the students' progress, academic achievement and the environmental factors of the 212 students in the study sample were examined as follows:

1. Age at grade one entrance.
2. Health factors.
3. Home status.
4. Father's occupation.
5. Achievement prior to grade seven.
6. Pre grade seven schooling in Edmonton.
7. Unit Scale Reading, grade four.
8. Spelling Ability Test, grade four.
9. Intelligence.

This information was presented in tabular form in the original study. The main information in these tables can be summarized as follows: In judging acceleration or retardation reference was made to Ayres' (3) scale of a two year span to represent normal progress for each grade. On this basis all the sample fall within the age span that is normal for the grade. Examination of health records in-

dicated that only 9 per cent may have been adversely affected by poor health. Health reasons therefore may be discounted as a major reason for failure.

Abnormal home conditions were twice as frequent among the failing group as in the reference sample. The differences between the two groups when tested by $\chi^2$ were significant at the .01 level of confidence.

A study of the socio-economic status of the home indicated that 58.5 per cent of the parents of the pupils in the study sample were in the unemployed, semi-skilled group. The reference sample showed only 15.5 per cent of parents in this group. Only 3.8 per cent of the study sample were in the managerial group as compared with 27.3 per cent of the reference sample.

The history of the academic progress in grades prior to grade seven revealed that the students who failed in grade seven were out of step academically before reaching grade seven. Over half the study sample had experienced failure in one or more grades, an additional thirty-one had been recommended (trial promotion) on one or more occasions. Those who did pass all grades were mainly borderline cases.

An examination of the reading scores of the study sample taken at grade four indicated that thirty-six students of the 212 scored normal or better scores, while 72.6 per cent showed reading disability varying from slight to serious. The spelling ability test also given at grade four indicated that this group of students were poor spellers. Only 35 per cent of those who took the test had normal or better than normal scores.

Low mental ability is referred to frequently in the related literature as one of the major reasons for failure. The recorded scores of the 212 failing students were examined and compared with the reference sample. I.Q.'s below 95 made up 59.6 per cent of the study sample as compared with 18.7 per cent of the reference sample. The study sample had 11 per cent of the test scores 105 and above as compared with 51.8 per cent of the reference sample. The differences between the study sample and the reference sample were significant at the .01 level of confidence.

### Grade Seven Study

The following aspects of student progress of the 212 study sample were tabulated:

1. Age at grade seven failure.
2. Attendance in grade seven, the year of failure.
3. The teachers' ratings of personality development at grade seven, the year of failure.

An examination of the data reveals that although all the study sample were of normal age at the time of grade one entrance, by the time they had reached grade seven 63.2 per cent were retarded from one to four years.

When attendance at grade seven was considered 77.3 per cent had attendance of 160 or more days. Forty-seven, or 22.7 per cent had attendance of fewer than 160 days. Considering that this latter group are generally poor achievers, the poor attendance may have had some bearing on the year's results.

The teachers' ratings of these students in personality development is of particular significance. Six areas in personality development (emotional control, creativeness, judgment, co-operation, dependability and courtesy) were studied first for the study sample and then compared with the reference sample. Teachers' ratings in these areas are made with reference to a handbook issued by the Edmonton Public School Board. This rating is done on the four point scale: 1. Very Good, 2. Good (average pupil), 3. Fair (a smaller number will rate 3), 4. Poor (only a very few poorly adjusted students would need to be rated as 4).

It is apparent that this group of failures were more trouble to their teachers than the normal group and generally have been rated lower in all six ratings of the personality development scale.

### Post Grade Seven Study

The study of the post grade seven phase of the educational history of the 212 failures was considered under the following headings:

1. The Reading Ability Test, grade eight.
2. The Spelling Improvement Test, grade eight.
3. Grade eight averages.
4. Grade nine averages.
5. Grade nine departmental transmuted scores.
6. Grade ten averages.
7. Grade ten credits earned.
8. Grade eleven averages.
9. Grade eleven credits earned.
10. Grade twelve results.
11. Drop-outs from the city system.

This information was presented in tabular form. Both the Reading Ability Test and the Spelling Improvement Test were normalized on the population of grade eight students in Edmonton Public Schools.

Of the original 212, eighty students dropped out of school at grade seven. Of those who took the Reading Ability Test, 53 per cent were below normal for their grade and 55 per cent of those who took the Spelling Improvement Test were below the scores considered normal for the grade.

By June of the grade eight year ninety-eight students had left school. Of the remainder only thirty-four made passing averages, but trial promotions and other devices enabled eighty-two to go on to grade nine.

Only seventy-two of the original 212 wrote the grade nine finals. Of these only one received an A standing, thirty received B, thirty-seven received C and there were four D standings. An examination of the transmuted departmental scores of this group of seventy-two shows a wide range of variation. A range of 70 per cent was shown in reading, a range of about 60 per cent was shown in Mathematics, Language, Social Studies and Science. Literature, which was based on a total mark of fifty, showed a range of nearly 40 per cent.

By the time the grade ten finals were written only forty-seven students remained; the others had dropped out of school. Nineteen, or 39 per cent, received averages of 50 per cent or better, and only seventeen actually completed a grade ten programme.

Only twenty-two of the original 212 wrote the grade eleven finals. Of these only six secured an average of 50 per cent or better.

By the time grade twelve was reached only nine of the original 212 students remained in school. Of these one received matriculation, three received diplomas in Business Education, and one a General diploma. The other four did not receive diplomas.

The drop-out rate of the grade seven failures, when added cumulatively, is rather striking. Eighty students left school after failure in grade seven; a total of 130 by grade eight. This total is increased to 159 by grade nine, to 168 by grade ten and 203 at the end of grade eleven. Of the remaining nine who entered grade twelve, only five completed their course to receive a high school diploma, and only one received a matriculation standing.

### Relationship of Selected Factors to Failure

Certain pertinent factors affecting failure were tabulated and tested for significance.

Table I indicates a relationship between the age at grade seven failure and the intelligence quotient significant to the .01 level of confidence. The table shows that generally the older a student is in grade seven the lower his intelligence will be. This table underlines the importance of intelligence as one of the factors in retardation.

TABLE I

DISTRIBUTION OF AGE AND I.Q. AT GRADE SEVEN FAILURE

| Age | I.Q. | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Below 74 | 75 to 84 | 85 to 94 | 95 to 104 | 105 to 114 | 115 to 124 | Blank | Total |
| 16-7 and over | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 15-7 to 16-6 | 6 | 4 | 1 | 1 | 0 | 0 | 2 | 14 |
| 14-7 to 15-6 | 7 | 14 | 10 | 5 | 1 | 0 | 7 | 44 |
| 13-7 to 14-6 | 2 | 15 | 32 | 16 | 4 | 0 | 5 | 74 |
| 12-7 to 13-6 | 0 | 6 | 15 | 34 | 10 | 2 | 7 | 74 |
| 12-6 or less | 0 | 0 | 0 | 1 | 2 | 1 | 0 | 4 |
| Totals | 17 | 39 | 58 | 57 | 17 | 3 | 21 | 212 |

TABLE II

AGE AT GRADE SEVEN FAILURE AND ACHIEVEMENT PRIOR TO GRADE SEVEN

| Age | Progress | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Repeated Two or More Grades | Repeated One Grade | Recommended Two or More Grades | Recommended One Grade | Clear Passes | Accelerated One Year | Blank | Total |
| 16-7 and over | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 15-7 to 16-6 | 8 | 0 | 1 | 0 | 0 | 0 | 5 | 14 |
| 14-7 to 15-6 | 27 | 10 | 1 | 0 | 0 | 0 | 6 | 44 |
| 13-7 to 14-6 | 4 | 56 | 0 | 5 | 8 | 0 | 1 | 74 |
| 12-7 to 13-6 | 0 | 4 | 5 | 18 | 42 | 0 | 5 | 74 |
| 12-6 or less | 0 | 0 | 0 | 1 | 2 | 1 | 0 | 4 |
| Totals | 41 | 70 | 7 | 24 | 52 | 1 | 17 | 212 |

Table II examines the possible relationship between the age at grade seven and the academic achievement prior to grade seven. This table indicates that those who are overage in grade seven at the time of failure are overage because of failure in elementary grades. More than half the sample, 52.4 per cent, had repeated one or more grades in their earlier school years. The relationship be-

tween age in grade seven and achievement prior to grade seven is significant at the .01 level of confidence.

What is the relationship between the age at grade seven failure and drop-outs from the Edmonton city system? Table III examines this relationship.

TABLE III

AGE AT GRADE SEVEN FAILURE AND DROP-OUTS FROM THE CITY SYSTEM

| Age | Drop-Outs | | | | | | |
|---|---|---|---|---|---|---|---|
| | At Grade 7 | At Grade 8 | At Grade 9 | At Grade 10 | At Grade 11 | At Grade 12 | Total |
| 16-7 and over | 1 | 0 | 1 | 0 | 0 | 0 | 2 |
| 15-7 to 16-6 | 13 | 1 | 0 | 0 | 0 | 0 | 14 |
| 14-7 to 15-6 | 30 | 10 | 1 | 1 | 2 | 0 | 44 |
| 13-7 to 14-6 | 23 | 24 | 14 | 9 | 2 | 2 | 74 |
| 12-7 to 13-6 | 12 | 14 | 13 | 17 | 11 | 7 | 74 |
| 12-6 or less | 0 | 1 | 0 | 1 | 1 | 1 | 4 |
| Totals | 79 | 50 | 29 | 28 | 16 | 10 | 212 |

Table III indicates that the older students generally drop out first. Of the sixteen oldest students in our study sample, fifteen had dropped out by grade eight and the other in grade nine. In detecting potential drop-outs at the grade seven level, the age factor is an important prognosticator of an imminent drop-out. The relationship between age at grade seven and drop-outs from the city system is significant at the .01 level of confidence.

Table IV examines the relationship between the fathers' occupations and the intelligence of the children that make up the study sample.

TABLE IV

FATHERS' OR GUARDIANS' OCCUPATIONS AND INTELLIGENCE QUOTIENT (LAYCOCK MENTAL ABILITY TEST)

| | Below 74 | 75 to 84 | 85 to 94 | 95 to 104 | 105 to 114 | 115 to 124 | Blank | Total |
|---|---|---|---|---|---|---|---|---|
| Unemployed | 1 | 2 | 3 | 1 | 0 | 0 | 1 | 8 |
| Unskilled | 4 | 9 | 12 | 11 | 1 | 0 | 3 | 40 |
| Semi-skilled | 5 | 14 | 15 | 22 | 9 | 1 | 11 | 77 |
| Skilled | 6 | 13 | 27 | 21 | 5 | 2 | 5 | 79 |
| Professional | 1 | 1 | 1 | 3 | 1 | 0 | 1 | 8 |
| Totals | 17 | 37 | 58 | 58 | 16 | 3 | 21 | 212 |

The relationship between the fathers' occupations and the intelligence of the children when tested by $\chi^2$ was not significant.

### Conclusions Respecting Progress Prior to Grade Seven

1. Late starting in school was not a factor in later retardation. All of the pupils in the study sample began grade one within normal age limits.

2. More than half of the 212 had failed once or more during their elementary school years. An additional 14.1 per cent had received trial promotions on one or more occasions. There was ample evidence to indicate that these students were having difficulty in school prior to reaching grade seven.

3. These students were handicapped by low intelligence. A comparison of the study sample with the reference sample indicated 59.6 per cent of the failures as against 18.7 per cent of the reference sample had I.Q.'s below ninety-five. Only 11 per cent of the failures, as compared with 51.8 per cent of the reference sample, had I.Q.'s above 105. The majority of the students in the study sample could not proceed at a normal rate because of a lack of ability.

### Conclusions Respecting the Grade Seven Study

1. At the time of failure in grade seven 63.2 per cent were overage for their grade. Since they all started school within normal age limits this retardation was due to failure in elementary grades.

2. The failing students rated significantly lower on all six areas of the personality development scale on ratings given by the teacher than did the reference sample. The greater number of 3 and 4 ratings in the study sample was an indication that these pupils had much more difficulty adjusting to school than the average student.

### Conclusions Respecting the Post Grade Seven Study

1. Eighty students dropped out of school at grade seven, 159 by grade nine, 186 by grade ten and 203 by the end of grade eleven. A large number of these students had apparently "just waited" until they were of legal school leaving age.

2. Five students of the original sample of 212 completed high school. The chances of a grade seven failure completing high school seems to be about two in one hundred.

### General Conclusions With Respect to Failure

A study of the data indicates certain factors that caused failure at grade seven:

1. Low intelligence.
2. Poor achievement in elementary grades.
3. Poor attitude toward school.
4. Poor socio-economic status.

### Implications With Respect to Non-Promotion as a Policy

Of these 212 students who failed in grade seven, 63.2 per cent were overage for their grade because of previous failure or trial promotion. Certain questions arise with respect to these overage students: How did they adjust socially with younger students in the classroom? How did they do in sports? Did they become problems in the classroom? The study of the six areas of personality development indicates that there were areas of maladjustment for these students. It would seem that previous failure and poor achievement had conditioned these students to expect little success from school.

About 60 per cent of the failures had I.Q.'s below ninety-five. It would appear that this group is seriously handicapped with respect to making normal progress in school. It would seem that they could have benefitted from some type of programme apart from regular classes.

### Implications With Respect to Drop-Outs

A number of these students remained in school only until they reached the legal age of school leaving. It would seem likely that a number left school simply because the school curriculum had nothing to offer them. Should consideration be given to a general broadening of the curriculum to provide for those of lower intelligence? Should there be classes specifically for these students with a special programme of studies?

### Implications With Respect to the Present Experiment in Division I

An experiment is being tried in several Edmonton City schools with respect to three streams in Division I (grades one, two and three): an accelerated programme of two years, a regular programme of three years and a four year programme for the slow learner. The particular value of the programme is that students take the same work but at different rates according to their abilities.

No assessment of this programme has been made as yet but it is the first major step in recognition of individual differences. Calgary has had a similar plan for a longer period of time and Gillespie (15) in his assessment of it notes that the four year programme students do not achieve as well as the repeaters, and suggests it may be caused by the fact that teachers do not treat them differently from others in the class. It would appear that this experimental plan should provide separate classes for the slow learners. With this addition, the experimental plan may have partial answers to two of the major problems of promotion: the retardation of students is not as noticeable, and keeping the slow learners together will have the effect of keeping students of the same age group together. This

should reduce the problem of social maladjustment, and as students do not repeat but proceed at their own pace it should prevent the twin evils of boredom and frustration that have plagued the repeater in the past. The ultimate extension of this plan, with special classes for slow learners, to Divisions II and III in the entire school system, could possibly be the means of reducing the problems created by non-promotion in the Edmonton city system.

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AUTHOR'S NOTE: *Since this thesis was written the continuous progress plan has been made a city-wide, research project with all elementary schools participating.*

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# AN ANALYSIS OF THE WORK-WEEK OF A SAMPLE OF CENTRAL ALBERTA HIGH SCHOOL TEACHERS

M. R. Fenske and H. T. Sparby

Varying opinions exist regarding the total time required for performing the activities considered to be part of a teaching load. Different opinions also exist regarding teacher attitude towards teaching load. Many claims have been made but few of these claims have been supported by factual evidence.

## The Problem

*Nature of the Problem*

A teacher's actual teaching time is normally limited to those hours during which classes are legally conducted. Beyond this minimum working time a teacher may engage in a number of tasks which are related to classroom work but which are not necessarily performed either in the classroom or during school hours. These tasks too are considered to be part of a teacher's duties. The extent to which a teacher carries on these additional tasks has an important bearing on his actual total work. Knowing what a teacher's total teaching load is and the attitude of the teacher towards this load is of importance to administrators.

*Statement of the Problem*

The purpose of this study was to analyze the work-week of a group of Central Alberta high school teachers. More particularly it was to examine:

1. The relationship between the following factors and the hourly work-week of teachers:
   (a) Subjects taught.
   (b) Teaching experience.
   (c) Sex of teacher.
   (e) Size of school.
2. The main areas of complaint that teachers have concerning their teaching load.
3. Teachers' and principals' estimates of a suitable teaching load.

*Importance of the Study*

Teaching load is one of the factors in promoting or destroying teacher morale (3). Teachers who feel overloaded, either in actual working time or in comparison with other teachers, do not take as much interest in their work as they normally would. A knowledge

of what teaching loads are and what it is felt that they should be is of value to administrators in assigning teaching duties and extracurricular activities. Proper teaching loads promote morale and cause the school to operate at a higher plane in terms of both efficiency and results.

## Definitions of Terms Used

*Teacher*

An individual who holds a valid teaching certificate and who is employed to instruct students, but who is not designated as a principal, assistant principal, vice-principal, or supervisor.

*Supervision*

Observing and controlling students engaged during school hours in required school activities exclusive of instruction.

*Extracurricular Activities*

Student activities sponsored by the school, but not compulsory in so far as student participation is concerned.

*Work-week*

The total weekly time in hours required to perform a number of varied tasks which are considered to be part of a teacher's normal duties.

## Limitations

*Geographical Area*

The schools included in this study were those located within an area extending across the province and bounded approximately on the north and south by lines through the cities of Edmonton and Calgary. Edmonton and Calgary schools were not included.

*Schools*

Only those schools were included which:

(a) Offered standard instruction time to high school classes.

(b) Had staffs, including administrators, which did not exceed ten in number.

*Personnel*

Only those teachers were included who devoted the major portion of their classroom instruction time to high school classes. In schools where Grade IX was departmentalized with the high school, the Grade IX classes were considered to be high school classes.

## Method of Procedure

A trial run of the questionnaire, to check its validity, was conducted late in September in the Lacombe School Division No. 56. The junior high school teachers were used as the sample. In

January the questionnaire was sent to the teachers and principals included in the study. Two weeks after receiving the replies a reliability check was conducted on the teacher returns. Completed questionnaires were received from two hundred and seven of the two hundred and thirty-six teachers (87.7 per cent return) and from seventy of the seventy-six principals (92.1 per cent return). The reliability check showed a 98 per cent agreement between first and second responses.

The teachers responding to the questionnaire were divided into various groups according to certain factors which were thought to have a possible relationship with teaching load. The median test (2) was employed in analysing the data. Both the .05 and the .01 levels of significance were used.

## Findings

Table I presents a summary of the teaching load of the two hundred and six Central Alberta high school teachers included in this study. Considerable variation in the time spent on the various

TABLE I

TEACHING LOAD FOR A SAMPLE OF 206 CENTRAL ALBERTA HIGH SCHOOL TEACHERS

| Duty | Total Time | |
|---|---|---|
| | Range | Median |
| Classroom Instruction | 13.33 to 27.50 | 21.63 |
| Supervision | 0.00 to 12.80 | 2.48 |
| Preparation | 0.00 to 20.00 | 7.48 |
| Marking | 0.00 to 20.00 | 5.48 |
| Extracurricular | 0.00 to 15.00 | 1.00 |
| *Other Duties | 0.00 to 8.50 | 5.17 |
| All Duties | 26.00 to 68.0 | 43.27 |

*Note: "Other" duties include: Students' Union, guidance, clerical, staff meetings, research projects, and Home and School Association meetings.

duties is evident. Three duties— classroom instruction, preparation of lessons and materials, and marking examinations and assignments—make up over 75 per cent of the median teaching load of 43.27 hours per week.

*Subjects Taught and Teaching Load*

Table II presents a summary of significant differences between the time spent on various duties by teachers of certain subjects and all other teachers. Teachers in the Home Economics-Industrial Arts and Business Education groups spent significantly less time on supervision than did other teachers. Teachers in the Social Studies-English Literature group spent significantly more time, while teachers in the Home Economics-Industrial Arts group spent significantly less time, on marking examinations and assignments than did other teachers. Teachers in the Home Economics-Industrial Arts group spent significantly less time on total teaching duties, than did other teachers. It may be concluded, therefore, that there is some relationship, though very weak, between subject field and total teaching load.

TABLE II

SIGNIFICANT DIFFERENCES BETWEEN TIME SPENT ON VARIOUS DUTIES BY TEACHERS OF CERTAIN SUBJECTS AND ALL OTHER TEACHERS

| Subject Field | Duties | | | | | |
|---|---|---|---|---|---|---|
| | Classroom Instruction | Supervision | Preparation | Marking | Extracurricular Activities | Total Time |
| Math.-Science | nil | nil | nil | nil | nil | nil |
| Soc. St.-Eng. Lit. | nil | nil | nil | .05 | nil | nil |
| Foreign Languages | nil | nil | nil | nil | nil | nil |
| Business Education | nil | .05 | nil | nil | nil | nil |
| Home Ec. Ind. Arts | nil | .01 | nil | .05 | nil | .05 |
| Off Pattern | nil | nil | nil | nil | nil | nil |
| Others | nil | nil | nil | nil | nil | nil |

*Teaching Experience and Teaching Load*

Table III presents a summary of significant differences between the time spent on various duties by teachers with different years of teaching experience and all other teachers. Teachers with 0 years of teaching experience spent significantly more time, while teachers with 21 or more years of teaching experience spent significantly less

time on preparation than did other teachers. Teachers with 0 years and those with 1 or 2 years of teaching experience spent significantly more time on extracurricular activities than did teachers of all other groups. No group had a total teaching load which was significantly different from the load of all other teachers.

TABLE III

SIGNIFICANT DIFFERENCES BETWEEN TIME SPENT ON VARIOUS DUTIES BY TEACHERS WITH VARYING YEARS OF TEACHING EXPERIENCE AND ALL OTHER TEACHERS

| Year of Experience | Duties | | | | |
|---|---|---|---|---|---|
| | Classroom Instruction | Preparation | Marking | Extracurricular Activities | Total Time |
| 0 | nil | .05 | nil | .05 | nil |
| 1 to 2 | nil | nil | nil | .05 | nil |
| 3 to 5 | nil | nil | nil | nil | nil |
| 6 to 10 | nil | nil | nil | nil | nil |
| 11 to 20 | nil | nil | nil | nil | nil |
| 21 or more | nil | .05 | nil | nil | nil |

*Years of Training and Teaching Load*

No significant differences were found between the time spent on various duties by teachers with different years of teacher training and all other teachers.

*Sex of Teacher and Teaching Load*

An analysis of the teaching loads of male and female teachers revealed that the male teachers had spent significantly less time (.05 level) on marking examinations and assignments, but significantly more time (.01 level) on extracurricular activities, than their female counterparts. No significant difference existed between the total teaching load of male and female teachers.

*Size of School and Teaching Load*

An analysis of the teaching loads of teachers from variously sized high schools revealed that teachers in high schools employing 2 or 3 teachers spent a significantly greater amount of time (.01 level) in classroom instruction than did other teachers. There were no other significant differences between the time spent by teachers from variously sized high schools and all other teachers, nor were there any significant differences in their total teaching loads.

*Satisfaction with Teaching Load*

A summary of the data pertaining to total teaching load and teacher dissatisfaction is presented in Figure 1. Among the teachers whose total teaching load is less than 30 hours per week 80 per cent are satisfied. The remaining 20 per cent feel that they should be carrying a greater teaching load. The greatest degree of satisfaction with teaching load (90 per cent) is found in the group whose total load was between 30 and 35 hours per week. Of the remaining 10 per cent of this group, half thought they should be carrying a greater teaching load, and half desired a reduced teaching load. All teachers whose teaching load exceeded 60 hours per week were dissatisfied.

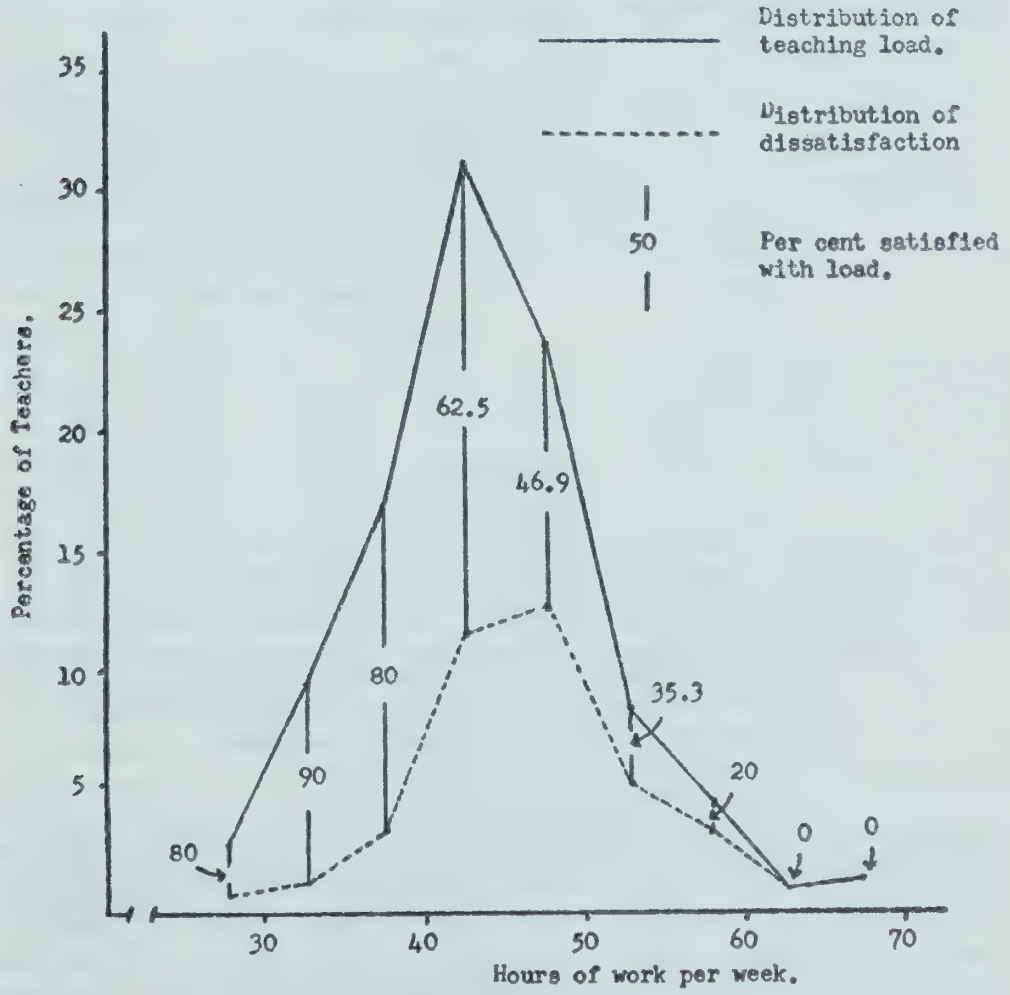


Figure 1.

Distribution of Teaching Load and Dissatisfaction for a sample of 206 Central Alberta High School Teachers.

In general, Figure 1, illustrates that teacher satisfaction is apparently related to total teaching load in the sense that as the total teaching load increases the degree of teacher satisfaction decreases.

*Estimates of Suitable Teaching Loads*

Table IV presents a summary of significant differences between the time actually spent by teachers on various teaching duties and the time as recommended by principals and teachers.

The recommendations of both principals and teachers were significantly less than the actual time spent in (a) classroom instruction and (b) preparation. The recommendations of both principals and teachers were significantly greater than the actual time spent on extracurricular activities. The principals recommended that significantly less time be spent in marking. The total teaching loads recommended by principals and teachers were both significantly less than the total loads reported by the teachers.

TABLE IV

SIGNIFICANT DIFFERENCES* BETWEEN THE TIME ACTUALLY SPENT BY TEACHERS ON VARIOUS TEACHING DUTIES AND THE TIME AS RECOMMENDED BY PRINCIPALS AND TEACHERS

| Group | Teaching Duties | | | | | |
|---|---|---|---|---|---|---|
| | Classroom Instruction | Supervision | Preparation | Marking | Extracurricular Activities | Total Time |
| Principals | .05 | nil | .01 | .01 | .05 | .01 |
| Teachers | .01 | nil | .05 | nil | .01 | .01 |

*Note: The calculation of significant differences was based upon a comparison of principals' recommendations and teachers' recommendations with teachers' actual median time spent on the various teaching activities.

## Summary and Conclusions

1. As reported by the teachers themselves, the average teaching load of central Alberta high school teachers is over 40 hours per week. The reported teaching loads ranged from 26 to 68 hours per week with the median time being 43.27 hours. Twenty-nine decimal six per cent of the teachers reported loads of less than 40 hours per week, while 15.5 per cent reported loads of 50 hours or more. Although there was considerable variation in teaching load, 52.9 per cent of the teachers reported loads within five hours of the median time for all teachers.
2. The subject field in which a teacher is working bears some relationship to the teacher's teaching load; but the relationship is not strong. In so far as total teaching load is concerned, there is

a significant difference, at the .05 level, between the load carried by teachers in the Home Economics-Industrial Arts group and the load carried by all other teachers. The teachers in the Home Economics-Industrial Arts group spent significantly less time on total teaching duties than did the other teachers.

3. Length of teaching experience, amount of training, sex, and size of school are not significantly related to total teaching load. There is a significant relationship, however, between some of these factors and some of the duties which make up the total teaching load. An example of this was the time spent on extracurricular activities. (See item 5 below.)
4. The degree of teacher satisfaction with a teaching load is apparently related to the size of the load. As the size of the load increases, so also does the degree of teacher dissatisfaction. Among teachers with teaching loads between 35 and 40 hours per week, 20 per cent reported dissatisfaction. When teaching loads were between 45 and 50 hours per week, 53.1 per cent of the teachers were dissatisfied. When the loads were 60 hours or more, 100 per cent of the teachers were dissatisfied.
5. Among the teachers included in this investigation, there is an unequal distribution of time spent on extracurricular activities. Of the teachers reporting, 34.9 per cent reported doing no extracurricular work at all. Furthermore, there is a significant difference between the time spent on extracurricular activities by (a) teachers with 0 years teaching experience, (b) teachers with 1 or 2 years teaching experience, and (c) male teachers, and all other teachers in each case. Each of these three groups of teachers spent significantly more time on extracurricular activities than did other teachers.
6. A decrease in the median hourly work-week for teachers was recommended by both the principals and the teachers themselves. These recommendations were significantly different from the existing teaching load. Teachers recommended a decrease to 40 hours; principals to 39.5 hours.

## Discussion of Results

Since this investigation revealed only one instance of a significant relationship between total teaching load and subject field, length of experience, amount of training, sex, and size of school, none of these five factors alone is apparently of major importance when determining total teaching loads.

Since there is some direct relationship between teaching load and teacher dissatisfaction, it should be possible to decrease teacher dis-

satisfaction by reducing the total teaching load. This could be achieved, of course, by adjusting the various duties which compose the total teaching load and/or arriving at a more equitable distribution of existing duties.

Although the number of hours per week spent in the activities required of a professional person is not necessarily the best criterion by which to judge the profession, it is nevertheless a convenient starting point for analysing the duties which a professional person is called upon to perform.

## Recommendations

The following recommendations are based upon the conclusions as previously stated:

1. The time which high school teachers are required to devote to classroom instruction should be reduced to about twenty hours per week. The over-all effect of such a reduction, plus the resulting reduction in time required to carry out other duties closely associated with classroom instruction, would be to reduce by two or three hours the total teaching load. This would bring the total load close to that recommended by the teachers included in this investigation. It should also increase teacher satisfaction and boost morale.
2. Supervision of extracurricular activities should be treated as a normal teaching duty. If it is treated instead as a voluntary duty, the results may well be total teaching loads between which unfavorable comparisons can be made. This situation can cause increased teacher dissatisfaction and decreased teacher morale. Administrators must accept the responsibility of assigning a fair distribution of extracurricular activities among teachers.

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# READING INTERESTS OF PUPILS IN THE INTERMEDIATE GRADES IN THE PUBLIC SCHOOLS IN A SMALL URBAN CENTER

EDWIN MCKENZIE

## The Problem

The purpose of the study was to survey the reading interests of pupils in Grades 4, 5, and 6 in a small urban center. The information gathered covered the following points:

(1) The amount and variety of reading done by the pupils in Grades 4, 5 and 6.

(2) A comparison of the reading done between the boys and girls in these grades.

(3) A comparison of the amount and variety of reading done between the poor, average and good readers.

## Method

The reading interests of 1,081 children were determined for a three-month period, January through March, 1958, by the use of a book check slip which each child completed after reading a book. In total, 5,482 slips were received.

In the interests of uniformity of procedure, the co-operation of the teachers was sought in supervising pupils participating in the survey. The teachers were instructed to allow the children complete freedom in their choice of books, but to emphasize that the survey in no way constituted a contest to see which child or class would read the greatest number of books during the three month period.

## Libraries

*The Community Library*

The Canadian Library Association has approved certain requirements for satisfactory service in Canadian libraries. In comparing the number of books provided by the community library with the requirements advocated by the Canadian Library Association, it was found that the local library should have almost three times as many volumes for both adult and juvenile reading as are presently available. On the other hand the reader membership in both categories was only slightly below the standard suggested by the Canadian Library Association, namely twenty per cent of the city population.

The Public Library, although small is size, seems to be providing a service adequate to the present community. Judging by the cir-

culation figures, the response by the juvenile readers to the services offered by the library is enthusiastic. The various programs planned by the children's librarian to persuade young people to use the library are being very well received, so much so that the present facilities are sometimes being strained to provide them.

*The School Libraries*

The Senior High School central library is adequate in size and facilities. It plays a very important part in the organization of the school, but its services are seriously curtailed by the lack of a full-time librarian.

The library in the Junior High School is rather a makeshift affair, inadequate in both size and facilities to provide for the students in the building. The teacher-librarian is allowed two periods per week to supervise the library and to take complete charge of ordering, cataloguing and providing whatever service she can within the limits of the time provided.

Apart from the Composite High School and the Junior High School the remaining schools in the system provide library services by means of classroom libraries. The Board of Trustees provides a library grant of $50.00 per room per year for books, and newly established classrooms are given a grant of $100.00 per year for five years in order to establish a minimum library as quickly as possible.

## Findings

*Children's Interests in Reading*

The study of reading interests was designed to determine: (1) the extent to which the pupils in the intermediate grades in the schools in Medicine Hat were making use of the library facilities in their classrooms, (2) whether there was any distinct pattern to the reading preferences of the children as they progressed through the grades, (3) if a childs' reading ability influenced the number of books

TABLE I

FICTION BOOKS

| Section | Type of Book |
|---|---|
| 1 | Adventure Stories |
| 2 | Animal Stories |
| 3 | Stories of Other Lands |
| 4 | Fairy Stories and Folk Tales |
| 5 | Mystery Stories |
| 6 | Cowboy Stories and Stories of the West |
| 7 | Stories of Indians and Pioneers |
| 8 | Children's Stories |
| 9 | Sport Stories |
| 10 | Stories from the Basic Readers |

he read and the type of books he chose, and (4) the difference between the reading choices of boys and girls.

Books were first classified as fiction and non-fiction and further classified as shown in Tables I and II.

TABLE II

NON-FICTION BOOKS

| Section | Type of Book |
|---|---|
| 1 | Scientific |
| 2 | History and Geography |
| 3 | Biographical |
| 4 | Other non-fiction books |

TABLE III

TYPES OF READING IN ORDER OF FREQUENCY

| Grade | Order of Frequency | Type of Story | Per Cent Read |
|---|---|---|---|
| Four | 1 | Animal Stories | 26.2 |
| | 2 | Adventure Stories | 15.3 |
| | 3 | Children's Stories | 13.7 |
| | 4 | Non-Fiction | 11.2 |
| | 5 | Fairy Stories | 10.3 |
| | 6 | Children of Other Lands | 6.9 |
| | 7 | Social Studies | 6.7 |
| Five | 1 | Adventure Stories | 24.1 |
| | 2 | Non-Fiction | 16.7 |
| | 3 | Mystery Stories | 13.6 |
| | 4 | Children's Stories | 13.5 |
| | 5 | Animal Stories | 13.1 |
| | 6 | Social Studies | 7.7 |
| | 7 | Fairy Stories | 6.5 |
| Six | 1 | Adventure Stories | 36.7 |
| | 2 | Mystery Stories | 25.8 |
| | 3 | Animal Stories | 9.3 |
| | 4 | Non-Fiction | 7.6 |
| | 5 | Children's Stories | 6.1 |
| | 6 | Cowboy Stories and Stories of the West | 4.9 |
| | 7 | Biography | 3.2 |

*Reading Preferences of Intermediate Grade Pupils*

A compilation of all books read during the period of the survey (three months) indicated very little difference in the average number of books read by the pupils in each of the grades. On the average each student read five books.

Table III shows by grade the types of reading in order of frequency. The first three sections in each grade account for 55.2 per cent of Grade 4 reading, 54.2 per cent of Grade 5, and 71.8 per cent

of Grade 6 reading. This suggests that Grade 6 concentrates its reading, while the lower grades are sampling over a much wider range of material. Grade 6 obviously prefers adventure and mystery.

*Reading Interests According to Reading Ability*

An attempt was made to discover whether a child's reading ability had an appreciable effect on the number of books he read or the type of books he chose.

The pupils were arranged according to reading ability as measured by the Stanford Reading Test, and then further subdivided into top, middle and bottom groups. Generally speaking the reading interests of these sub-groups did differ appreciably from the total groups, and the top group of readers in each grade read almost twice as many books as did those in the bottom group. The interest in Animal Stories evinced by the total Grade 4 population was apparently heavily weighted by the poorer readers who chose 33.4 per cent of their books from this category, a choice which was ten per cent higher than that of the top and middle groups.

Non-fiction books seemed to be a heavy favorite with the slow readers in both Grades 4 and 5. Almost a third of the choices of the poor readers in Grade 5 were from this category. It would seem that the poor readers' choice of books may have been influenced by the work they were doing in school. Those children who read well, read more, and the poor readers do not voluntarily turn to books for their entertainment but rather look upon reading as a task which they must do in order to succeed in their school work.

*Reading Interests According to Sex*

At the Grade 4 level Animal Stories, the most popular choice of the total group, was not the major choice of the girls. Boys chose almost twice as many stories about animals as did the girls. Boys chose stories about Children in Other Lands almost twice as often as the girls did, but this preference was reversed in Children's Stories which were almost twice as popular with the girls as with the boys. For the most part, at the Grade 4 level, the boys were more interested in non-fiction types of books than the girls were.

At the Grade 5 level the differences in interests between boys and girls became more evident. Adventure and Animal Stories were chosen almost equally by boys and girls, but the girls evinced a keen interest in Mystery Stories. Over twice as many books in this category were chosen by girls than by boys. This proportion increased even more in the field of Children's Stories where again the girls showed the greater interest. This trend in interest between boys and girls continued into Grade 6, where the girls' interest was

almost twice as great as the boys' in the categories of Mystery Books and Children's Stories. In the non-fiction category boys showed considerably greater interest than did girls.

*Most Popular Books and Authors*

The subjects of the present study were limited to the books available to them from the classroom, the home and public library, and thus the findings in this part of the study may be biased.

Table IV lists those books and authors which were chosen fifteen times or more by the pupils in Grades 4, 5 and 6. Only at the Grade 4 level were the most popular books chosen from the field which was most popular as revealed by the total survey. Grade 4 showed a decided preference for Animal Stories, and authors of

TABLE IV

MOST POPULAR BOOKS AND AUTHORS

| Grade | No. of Times Chosen | Title | Author |
|---|---|---|---|
| Four | 28 | Burgess Animal Stories | Thornton Burgess |
| | 24 | Chee-chee and Keeko | Charles Thorson |
| | 25 | Mickey Mouse Stories | Walt Disney |
| | 20 | Billy and Blaze | C. W. Anderson |
| | 15 | Silver Stallion | Walter Farley |
| | 15 | Fury | William Fenton |
| | 15 | Peter Pan | J. M. Barrie |
| Five | 40 | Maud and Miska Petersham Stories | Maud and Miska Petersham |
| | 39 | Marie Neurath Stories | Marie Neurath |
| | 38 | Carol Keene Mysteries | Carol Keene |
| | 34 | Enid Blyton Stories | Enid Blyton |
| | 24 | Tom Sawyer | Mark Twain |
| | 24 | The Bobbsey Twin Stories | Laura Lee Hope |
| | 22 | The Fuller Orton Mysteries | Fuller Orton |
| | 19 | Paul Bunyan | D. J. McCormick |
| | 18 | Homer Price | R. McCloskey |
| | 16 | Treasure Island | R. L. Stevenson |
| | 15 | Burgess Animal Stories | Thornton Burgess |
| | 15 | Julie Campbell Mysteries | Julie Campbell |
| Six | 72 | Carol Keene Mysteries | Carol Keene |
| | 65 | F. W. Dixon Mysteries | F. W. Dixon |
| | 46 | Enid Blyton Stories | Enid Blyton |
| | 45 | Julie Campbell Stories | Julie Campbell |
| | 41 | Donna Parker Stories | Marcia Martin |
| | 33 | Helen Wells Stories | Helen Wells |
| | 32 | Frank Beal Stories | Frank Beal |
| | 16 | F. J. Judd Mysteries | F. K. Judd |
| | 15 | Lassie Stories | D. J. Snow |
| | 15 | Silver Chief Stories | J. O'Brien |
| | 15 | Roy Rogers Stories | Parker Elton |
| | 15 | Black Stallion Stories | Walter Farley |

Animal Stories rated first place in the listing of most popular writers. Although Adventure Stories rated 36.7 per cent of the reading done by Grade 6 and 24 per cent of that done by Grade 5 (Table III), the books and authors rated most popular did not reflect this: Mystery stories were favored. Series stories were likewise popular. Carol Keene, Frank W. Dixon, Marie Neurath, Enid Blyton and Thornton Burgess were favorite authors. Lazar (6) too found that series books were highly popular with boys and girls.

Of the books preferred by the pupils only six, *Paul Bunyan, Homer Price, The Lassie Stories, Silver Chief, Black Stallion* and the *Maud and Miska Petersham Stories* are included in the 2,700 titles of *Best Books for Children* (2). Of the titles which have been perennial favorites with children for generations only Tom Sawyer, Peter Pan, and Treasure Island reached the fifteen-choice mark. None of the titles from the Newbery Award list appeared.

## Summary

1. The pupils of Grades 4, 5 and 6 read an average of five books apiece in a three month period.

2. The upper third of the classes, determined by a reading test, read twice the number of books read by the lowest third.

3. Sex differences in reading interests appeared in Grade 4, and increased appreciably in Grades 5 and 6. In the latter grade the girls outnumbered the boys two to one in their choice of mystery books and children's stories, whereas the boys nearly reversed the score in the preference for non-fiction.

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# THE MEASUREMENT OF SENTENCE STRUCTURE OF DEAF CHILDREN

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Word order is a device used extensively in English to control the meaning of words in sentences. The difference between "the man killed the bear" and "the bear killed the man", or their subject-object relationship, depends on word order. Moreover, many words without changing their form change their functions as parts of speech depending on their location in relation to other words in the sentence, the reversal of "cold ice" to "ice cold" changing not only the modification but the parts of speech involved. Although the rules of word order in English are complex, most native Canadians have little difficulty in mastering this technique. Writing "straight" language, however, is a major problem for deaf children.

While deaf students at the Alberta School for the Deaf give their teachers daily evidence of a low level of language achievement, they were able to score at a considerably higher level on the standardized tests of language that had been in use for several years. In this test students were required to choose alternatives in word usage, to use punctuation and capitals, to differentiate between sentences and sentences fragments and to identify parts of speech, but not to construct language. Presented with a scrambled sentence, however, the student must choose his subject and predicate. If its form does not identify the function of a word, this must be decided by its relation to the rest of the sentence. This series of judgments approximates those made in writing original language. Therefore, the scrambled sentence technique is suggested as an objective means of testing the sentence construction of the deaf.

## A Review of the Research

While considerable research has been done on the intelligence of the deaf, research on achievement, especially in language, is meagre. In 1958 Goetzinger and Rousey of the University of Kansas (2), using the Wechsler Performance Scale obtained a mean I.Q. of 103.5, S.D. 13.4, on 101 deaf adolescents with a mean age of 17:2, S.D. 1.9. On the same students, using the Stanford Achievement Test (3), grade levels of 4.4 and 4.2 were obtained for Reading: Paragraph Meaning, and Reading: Word Meaning, respectively, compared to grade levels of 6.0 and 6.5 for Arithmetic Reasoning and Arithmetic Computation, respectively. Lavos in Michigan (5) found the correlation between the Pintner Test of General Ability and the Clarke

TABLE I

THE RANK-ORDER INTERCORRELATION OF THE SCRAMBLED SENTENCE TESTS SCORES WITH THE CRITERION SCORES AND OTHER VARIABLES

| | Scrambled Sentences Text X | Scrambled Sentences Tests II-III | Scrambled Sentences Tests I-IV | C. A. T. Mech. of English Subtest | Raven's Progressive Matrices | Structure Analysis of Ten Sentences | Impression of Fifty Words on Five Teachers |
|---|---|---|---|---|---|---|---|
| Scrambled Sentences Test X | 1.00 | .94 | .94 | .82 | .64 | .82 | .76 |
| Scrambled Sentences Tests II-III | | 1.00 | .98 | .79 | .41 | .81 | .79 |
| Scrambled Sentences Tests I-IV | | | 1.00 | .79 | .44 | .82 | .81 |
| C. A. T. Mechanics of English | | | | 1.00 | .53 | .65 | .65 |
| Raven's Progressive Matrices | | | | | 1.00 | .38 | .44 |
| Structural Analysis of Ten Sentences | | | | | | 1.00 | .84 |
| Impression of Fifty Words on Five Teachers | | | | | | | 1.00 |

## The Relationships of the Variables

*The Scrambled Sentences as a Measure of Language.* When the ranked scores on the Scrambled Sentences Tests were correlated with the ranked scores on the Mechanics of English and Grammar subtest of the California Achievement Tests, coefficients of .82, .78 and .79 were obtained, which were respectably high. The California subtest correlated with the subjective and objective criteria of sentence construction with coefficients of .65 and .65 as compared to a range of from .76 to .82 for various batteries of the Scrambled Sentences. All three forms of the Scrambled Sentences Tests correlate more highly with both criteria than does the California subtest, the differences being significant $<.01$ in each case. Judged by these criteria the Scrambled Sentences are better predictors of the language achievement of the deaf than the California Mechanics of English and Grammar subtest.

*The Scrambled Sentences as a Measure of Intelligence.* All three batteries of Scrambled Sentences correlate more highly with the three measures of language skills (California Achievement Test, structural analysis of sentences and teachers' impressions) than with the measure of intelligence, the differences being significant $<.01$ in all cases except one. This exception is the difference between the correlation of Test X and the teachers' impressions and Test X and the Progressive Matrices ($<.05$). It is concluded, therefore, that the Scrambled Sentences Tests are measures of language rather than of intelligence.

Graphs of the frequency distributions of the scores on the Scrambled Sentences Tests indicate that scores on Tests I-IV most nearly approach the normal curve of probability, while the graph from Test X has a tendency to be U-shaped. The deletion of items with lower and higher difficulty indices would seem to dichotomize the pupils rather than to measure their ability. As the range of difficulty of the items narrowed toward the index of .50, the test increasingly correlated with intelligence rather than with language ability. Because the population of this study was small, no conclusion was reached on this point.

*An Evaluation of the Criteria.* The coeffiicents of correlation of .38 and .44 between the criteria of sentence construction and the Matrices are reasonably close to the coefficient of .53 between the California Mechanics subtest and the 1938 Matrices of the present study, and to other coefficients between language and intelligence found in other research by Coutts and Baker (1) and by Lavos (5). This would indicate that the criterion procedures were relatively valid measures of language achievement. Their intercorelation coefficient of .84 is a measure of their reliability.

## Criterion Composition

Samples of Fifty Words Which Rated High, Average and Low

*Rating of 20 points.* Bill ran and hunted with a pack of coyotes. He knew everything that the coyotes did. He bayed at the moon with the coyotes. He thought he was a coyote, too. One day Bill crawled along the plains. A cowboy named Chuck was riding over the plain. —J.B.

*Rating of 10 points.* Mother and father coyotes helped him on a back. They did know everything he did. They ran and hunted to the ranch. Some animal could talked to Pecos Bill never hurt with them. Some coyote taught him how to talk. The coyote loved the child like a brother. —.N.S.

*Rating of 0 points.* Bill said, "I like the stars." Bill and Chuck when too far away. Chuck called, "The little boy come out of them." Chuck told the boy he said, "Chuck found and saw the little boy." The boy told Bill up dressed cowboy, that is Pecos Bill. —R.T.

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# A STUDY OF THE SPELLING ACHIEVEMENT OF RURAL HIGH SCHOOL PUPILS

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## Purpose of the Study

A popular belief today is that our high school students cannot spell. Business men deplore the fact that their employees misspell the simplest words; editors use the theme for numerous editorials. All state categorically that the high schools are to blame for turning out pupils who cannot spell. Even the teachers themselves complain of the numerous mistakes found in students' written assignments and are the first to admit that their pupils are not able to spell consistently well.

Are these complaints justified? It is generally conceded that they are. Mere opinion, however, is not enough. What is necessary is quantitative proof of the assertion. Some work has been done to measure spelling ability in the high school grades and in nearly every case the same conclusion is reached; that spelling ability is low at all levels, elementary, high school, and college.

Spelling as a formal subject is taught to the end of grade eight; thereafter any teaching of spelling is done incidentally. How many of the words that the student has been taught in the elementary grades are among the words misspelled in the high school grades? The test was designed to answer this question first.

Some of the related questions that need an answer deal with the achievement of bilingual students compared to that of students who come from homes where only English is spoken. It is common practice to blame under-achievement in spelling and other language skills on the fact that English is not spoken at home by the students and their parents. Is this an important factor in the spelling ability of bilingual students?

Several studies have shown that boys do not spell as well as girls of the same age. The usual explanation given is that girls mature earlier than boys and as a result their skill in spelling is greater. Is this still true in the later grades of high school when both girls and boys have reached maturity?

Another reason advanced for difference in spelling ability is the socio-economic factor, or the effect of environment. Illiteracy is sometimes considered as a correlate of low socio-economic status. In the rural areas the population falls quite naturally into four general groups, determined by the father's occupation rather than financial

competence. These four groups are: farmers, proprietors of small businesses, unskilled workers and professional type. Does the different home environment, or different attitudes of these four groups significantly affect the children's spelling ability? Dockrell (3) states in the study "The Relationship Between Socio-Economic Status, Intelligence, and Attainment in Some Scottish Primary Schools" that "When the I.Q. is held constant there is significant correlation between E.Q. (English Quotient) and socio-economic status." Since spelling is a factor in English achievement, it might be expected that a difference in spelling achievement will be revealed between the children from families of different economic status.

Various studies have been made of spelling errors found in both tests and written work. Later studies have shown that words change in difficulty as the student grows older. What are the words that high school students most frequently misspell? Do these words change as the student matures? Furthermore, what is the underlying reason why some students are weak in spelling? Some of the investigators have suggested that an indifferent attitude, laziness, carelessness and poor handwriting all contribute their share. An analysis of the gross data of this study was understaken to attempt to answer some of these questions with reference to rural high school students.

## Review of Related Studies

A survey of related literature reveals that there are two broad fields of investigation, one in which the researchers are measuring ability at various levels of the school population and the other in which spelling errors are analysed and reasons for misspelling are sought. The basic reference for spelling research is the section on "Spelling" by Ernest Horn in the *Encyclopedia of Educational Research.*

In 1948 Oliver Harris (8) investigated spelling achievement of 1,235 pupils in grades seven to twelve inclusive in a Pennsylvania high school by using a dictation type test of 195 words selected from a graded word list ranging from grade two level through high school. He found individual spelling achievement ranged from grade two to a substantial high school level, while the average achievement was low, four grades below the actual grade. He found that systematic study tended to accelerate progress in spelling achievement.

In 1951 Doris Hageman (7) and H. R. Laslett undertook a similar study of the spelling ability of 204 high school students divided among the four high school grades. The 320 words of this test were selected from words widely used in speech and writing. The mean of misspelled words was eighty, or twenty-five per cent, with a range

of two to 275 misspelled words. These investigators cite carelessness and laziness as probably the most common cause of spelling weakness, ". . . especially among poor spellers with high I.Q."

Another type of investigation was that of Dorothy Knoell and Chester Harris (9) who attempted to find out by factor analysis if spelling is a single ability. They found that there appears to be a general spelling ability factor which is measured by most tests.

Robert Coard (2) asked two classes of forty college freshmen to analyse the cause of their misspellings. It is surprising to find indifference was the most common reason given by these students for their errors. Carelessness, indifferent and incompetent teachers, poor pronunciation, and confusion of common words follow in that order.

Dwight L. Burton (1) experimented in teaching spelling by three different methods to three grade twelve classes, matched in intelligence and in the ability to spell as tested by a special spelling test. Each class was taught spelling by a different method for three months. Class A used the 5-step plan of Fitzgerald (4) to learn thirty words a week, with a weekly test. Class B studied one spelling rule a week with occasional weekly periods used for testing and review. Class C studied spelling "incidentally" by keeping and learning individual lists of troublesome words. When the second test was given after three months, the results showed no statistical difference for any of the three methods. The Class A method final mean score was significantly better than the mean score on the first test, but the other two groups failed to reach this level of significance though there was marked improvement. Burton concluded that this study indicated the benefits of systematic instruction in spelling.

What of the part phonetics play in teaching spelling? Ernest Horn (10) concluded that there is no escape from direct teaching of common words that do not conform to any rules. For every phonetic rule there are dozens of words that are exceptions; how can a rule be formulated that is of any assistance to the school child? Sister Roberta Wolff (13) found when studying spelling errors, that phonetic errors made up but 36.3 per cent of the whole, while 41 per cent were non-phonetic in origin and mechanical errors made up the remaining 27.7 per cent.

How do the students of today compare with those of a generation ago? Calvin C. Sifferd (11) conducted a survey by using the Buckingham Extension of the Ayres Spelling Test first given thirty years ago and measuring spelling ability against the norms. He found that only in the case of grade seven girls were the marks of thirty years ago surpassed by today's students.

## Design of the Problem

*Description of the sample*

Three school divisions, Calgary, Three Hills, and Wheatland, provided the pupils for the survey. The total high school population of this area, including grade nine, was approximately thirteen hundred.

Twenty-one schools participated, yielding a total of 568 pupils. Sickness and other reasons prevented forty-three of these from completing the test, leaving a final sample of 525 students. Of these, 203 were in grade nine, 140 in grade ten, 104 in grade eleven, and 78 in grade twelve.

This cannot be called a truly random sample; it is rather an incidental sample, yet it is forty per cent of the total high school population of these three school divisions. The schools are typical rural schools, situated in a small town, village, or community, the pupils coming from the surrounding farming areas. Four of the schools offer instruction to grade nine, two offer instruction to grade ten, three to grade eleven, and the remainder offer the complete high school programme.

*Construction of the Test*

This was a dictation type test, since the use of the word in context is the functional approach to spelling. Four hundred words were selected by random sampling from the elementary school spellers; an equal number from the spellers used in grades two to five, from the spellers used in grade six, from the grade seven speller, from the grade eight speller, and from the list of "demons" listed in the grade eight speller. Words with alternate spellings, and unusual or trick words were not included. A mistake in typing the test caused the omission of two words; the final test consisted of 398 words.

Each of the words was put into a simple sentence that would make the meaning clear. Explicit instructions were given so that the administration of the test was as uniform as possible. The teacher was asked to read the word, then the sentence, and repeat the word to be spelled once more. He was allowed to give any information that would make the procedure clear, but was not allowed to give any information that would help in the spelling of the word. It was suggested that the test be given in units of one hundred words.

*The Data Sheet*

To obtain the necessary information required in the sub-problems dealing with sex, bilingualism, and socio-economic status, the student filled out a data sheet to be attached to his paper. The teacher was asked for the I.Q. of each student, but this item proved useless,

as in many cases no I.Q. was available and in others it was an estimated I.Q. or the I.Q. resulting from a variety of tests.

*Scoring the Test*

The tests were marked by the investigator. The student was given the benefit of the doubt in the case of poor handwriting. In the matter of capitals, if the word demanded a capital, it was required. Although the test was designed to exclude words with alternate spellings, it was pointed out by the teachers that words such as "skillful," "jewellery", and "sulphur" although having no alternates in the spellers, do have alternative spellings in the *Thorndike-Barnhart Dictionary* and so both were accepted as correct.

*Purpose and Use of Data*

The number of errors constituted the student's score. These scores were arranged in five frequency distributions; one for the group as a whole and one for each grade. From these distributions achievement was expressed in terms of mean scores and standard deviations. Ten frequency distributions were arranged on the basis of bilingualism or unilingualism and grade; ten by dividing the total group and by grade on a sex basis; and four by separating the pupils into four socio-economic groups. In each case the significance of the difference of the means was ascertained by assuming the Null Hypothesis and referring the critical ratio to Fisher's "t" from Table D in Garrett (6). The variances were tested for homogeneity by use of the variance ratio and Table F in Garrett. In cases where it was found that the difference in means could have arisen from a difference in samples the Cochran and Cox test was used to determine if the difference in means was truly significant.

*Analysis of Gross Data*

This was done by taking 130 test papers from three high schools, in alphabetical order, and comprising twenty-five per cent of the entire group. The frequency of error of each of the 398 words in the test was determined by actual count. These frequencies were broken down into the errors made by each of the four grades and expressed as percentages of grade population. The total frequency of error was expressed as a percentage of the entire group.

The third part of the study was an analysis of kinds of error made in the ten most frequently misspelled words, in an attempt to find out how students misspell.

## The Error Frequency of the Test Words

An analysis of the sample of 130 test papers referred to in the last paragraph revealed that there are many high school students who have not retained the ability to spell the simple words they have

been taught in grade two. The words in group four, those chosen from the grade eight speller, seemed to give the most difficulty, followed closely by the group five list of "demons". Twenty-one per cent could not spell "mathematics" which word they must see every school day on the cover of the text book. With the exception of two words, the words with the highest error frequency are to be found in Furness' list of 231 high school "demons", and those with the lowest error frequency are to be found in Fitzgerald's list of 222 elementary school "demons". This supports Sifferd's (11) assertion that words change in order of difficulty through the years.

In examining the performance of the total group from the frequency distribution of spelling errors given in Table I it can be

TABLE I

FREQUENCY DISTRIBUTION OF SPELLING ERRORS MADE BY 525 HIGH SCHOOL PUPILS ON SPELLING TEST OF 398 WORDS

| Number of Errors Class Interval = 15 | Grade 9 f | Grade 10 f | Grade 11 f | Grade 12 f | Total Sample f |
|---|---|---|---|---|---|
| 1 to 14 | 38 | 38 | 25 | 25 | 126 |
| 15 to 29 | 31 | 40 | 24 | 26 | 121 |
| 30 to 44 | 40 | 22 | 16 | 12 | 90 |
| 45 to 59 | 23 | 10 | 15 | 4 | 52 |
| 60 to 74 | 12 | 13 | 10 | 6 | 41 |
| 75 to 89 | 19 | 8 | 5 | 2 | 34 |
| 90 to 104 | 13 | 3 | 3 | 1 | 20 |
| 105 to 119 | 7 | 2 | 2 | 0 | 11 |
| 120 to 134 | 8 | 1 | 2 | 0 | 11 |
| 135 to 149 | 2 | 0 | 1 | 1 | 4 |
| 150 to 164 | 2 | 0 | 0 | 0 | 2 |
| 165 to 179 | 0 | 1 | 0 | 0 | 1 |
| 180 to 194 | 1 | 0 | 0 | 0 | 1 |
| 195 to 209 | 0 | 1 | 0 | 0 | 1 |
| 210 to 224 | 1 | 0 | 0 | 0 | 1 |
| 225 to 239 | 2 | 0 | 1 | 0 | 3 |
| 240 to 254 | 2 | 0 | 0 | 0 | 2 |
| 255 to 269 | 1 | 1 | 0 | 1 | 3 |
| 270 to 284 | 1 | 0 | 0 | 0 | 1 |
| N = | 203 | 140 | 104 | 78 | 525 |

seen that the first three class intervals have by far the largest frequencies. After this they decrease in value very rapidly. What is not revealed by the table is that no student made a perfect score and only one student had but one error. The mean error score for

the entire sample was 44.94, ranging from 56.88 for grade nine to 31.60 for grade twelve. In all cases the standard deviations are large, indicating a wide range of spelling abilities in the individuals comprising the sample. Expressed in terms of percentiles the frequency of errors revealed that the ninety percentile score is five, or ten per cent of the entire group have fewer than five errors. The ten percentile score is ninety-five, or the lowest ten per cent have more than ninety-five errors.

This was the frequency distribution of the errors of the total group and by grades, and gives a quantitative picture of the achievement of the high school pupils in spelling words they have been taught. The answers to the related questions asked in the problem were then found by separating the scores according to sex, grade, bilingualism, and socio-economic status, and making the frequency distributions for the purpose of estimating significance or otherwise of the differences of the means.

## Summary of Findings

1. *Rural High School Students Are Poor Spellers.* Since this test was designed to measure the ability of rural high school students to spell words that they had studied, it seemed proper to expect a reasonably high level of proficiency. It was found instead that the level of attainment was surprisingly low, only fifty-nine per cent were able to spell ninety per cent of the test words correctly.

2. *Spelling Ability Improves Through the High School Grades.* There was gradual improvement in spelling ability from grade nine to grade twelve. We find that fifteen per cent of the grade twelve students failed to achieve as well as the average for grade nine; twenty-seven per cent of the grade eleven students failed to reach this level, and twenty-one per cent of the grade ten students made more mistakes than the average grade nine student.

3. *Girls Are Better Spellers than Boys in the Early High School Grades.* In grade nine, girls were significantly better than boys in spelling. In grades ten and eleven, the difference is less, but the superiority of the girls is statistically significant. In grade twelve the difference is slight and no longer significant.

4. *The Bilingual Students are Better Spellers in the Early High School Grades.* There is evidently no valid reason for the language teacher to blame bilingualism for poor results in spelling. In grade nine the bilingual students are significantly better spellers. In the other grades the observed difference is in favour of the bilingual groups, but the small samples in grades ten, eleven, and twelve, make the comparison meaningless. In this study the samples were com-

posed of mixed groups of boys and girls; it would be interesting to carry out a similar study with samples of bilingual boys or girls compared to similar samples of unilingual boys or girls. The sex factor no doubt affects the results of the present study, but the samples were too small to allow separating the sexes. The socio-economic factor is doubtless also active in the spelling achievement of these bilingual students, as a large proportion of them were children of unskilled workers or farmers.

5. *The Socio-Economics Factor is Important in Determining Spelling Ability.* When the students were grouped according to socio-economic status, the children of the professional workers had the lowest mean score, followed by the children of the small proprietors, the children of the unskilled workers and lastly the farmers. The very small sample of the professional group, sixteen, tended somewhat to invalidate the results for this group. When we test the significance of the difference of the means of the four groups, the only significant difference was between the farmer and the small proprietor groups, and in favour of the latter.

6. There is little difference in the kind of words misspelled by any of the grades. The types of error made are chiefly those of omission and phonetic substitution, with errors due to doubling and mispronunciation following in close order.

## Implications for the Classroom Teacher

A favorable attitude to accuracy in spelling must be established in the mind of the student before any remedial work can be done. Spache (12) says that the school must try to develop a spelling "conscience", a desire to spell correctly; and a spelling "consciousness", a critical attitude to one's own spelling. The second essential will be continuous emphasis on correct spelling at all times. Not only the language teacher, but all the high school teachers must require correct spelling from the students in all written work.

Formal teaching of spelling has its place, but the learning of rules and long lists of words has proved futile in the past as many authorities believe. A variable approach to the teaching of spelling will provide the best results. Students should be encouraged to seek out their own weaknesses and remedy them. The fact that "demon" lists contain relatively few words should suggest the mastery of a core vocabulary of these basic words.

Poor handwriting encourages poor spelling, and the student should be encouraged to write neatly and legibly. The high error scores in the study were without exception found on badly written tests papers.

The third essential to successful spelling achievement is continuous evaluation. It is desirable that the student learn to evaluate his own spelling. Skill in proof reading is valuable to this end. Standardized tests have some value in establishing norms, but more valuable are tests composed of the words used and learned in the classroom, and practised in the written work of the student.

These three items, a favorable attitude, a continuous emphasis on correct spelling with a variable approach, and continuous evaluation will assist the teacher in improving the spelling ability of his students. Because spelling ability is not highly correlated with intelligence, there is no reason why every high school student should not spell correctly.

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# THE STANDARD PROGRESSIVE MATRICES AS A CULTURE-REDUCED MEASURE OF GENERAL INTELLECTUAL ABILITY

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## The Problem

Teachers and counsellors frequently require an estimate of a pupil's potential intellectual ability which is as free as possible from the restrictions of an unfamiliar language or cultural context. Numerous studies in recent years have demonstrated what Binet (2) originally suspected—that the conventional verbal test of intelligence, which samples through the medium of a specific language and a set of cultural concepts more familiar to some than to others, discriminates against children who are not products of an urban middle-class culture.

Logically these findings point to the need both for greater caution in the interpretation of intelligence test results, and for the construction or identification of tests which tap important aspects of ability through a medium which is relatively independent of specific acquired knowledge. In the latter connection MacArthur (13) has shown that Raven's Coloured Progressive Matrices is a very promising instrument when used with a sample of Edmonton Grade III boys. This present paper reports, for a representative sample of Edmonton Grade VII pupils, a study of the nature of abilities measured by Raven's Standard Progressive Matrices, and its relation to socioeconomic status as compared with that of certain commonly-used group tests of intelligence. Some implications for teachers and administrators will also be considered.

## Rationale

Research studies described by Eells, et al (7) and Havighurst, et al (10) (11) demonstrate that mental tests vary significantly in the degree to which they differentiate between social classes in the community—that there is wide variation in the extent of cultural loading in currently-used tests. Tests of vocabulary and verbal reasoning are typically the most culturally weighted, but under what might be called the relatively fixed treatment of ordinary North American curricula they are also the best predictors of school success for the majority of pupils. However, for children who are unable to reveal their intellectual potential on verbal tests because of previous cultural and/or educational background such tests are

less useful as predictors, particularly when there is opportunity for such pupils to make good their verbal deficiencies through remedial work or a change of environment. Current emphasis on the identification of talented pupils from underprivileged backgrounds suggests the immediate practical use to which culture-reduced measures of intellectual ability may be put locally in the mental assessment of urban pupils of lower socioeconomic status, and of immigrant, Indian, Metis, and isolated rural children.

It was hypothesized that Raven's Standard Progressive Matrices would be a more suitable measuring instrument for these purposes than tests currently used as routine measures of intelligence in Edmonton schools. To investigate this hypothesis evidence was obtained on the extent to which the Standard Progressive Matrices met the following criteria: (a) demonstrates a minimum of cultural or educational loading; (b) samples a comprehensive and important aspect of general intelligence; (c) shows a moderately high relationship with school success; (d) shows a high degree of reliability; (e) is easy to administer and interpret.

(a) *Minimum cultural or educational loading.* A useful indication of cultural loading of a test can be provided by correlating the test results with measures of socioeconomic status. Items or tests which depend heavily on the richness of the verbal and educational stimulation received from a home where good books and cultured conversation abound may be expected to show high correlations with socioeconomic status. Conversely, a useful culture-reduced test should show relatively low correlations with socioeconomic status. It was hypothesized that Progressive Matrices would show lower correlation with socioeconomic status than do currently-used verbal tests of intelligence.

(b) *Importance of abilities sampled.* Havighurst (10) (11) has demonstrated that tests of spatial ability show little cultural loading, but they can scarcely be useful for assessing intellectual potential because of their specificity and lack of relation to academic success. Consequently it was necessary to examine whether the test in question can be considered as sampling a broad aspect of general intelligence common to a wide variety of mental abilities. The method of factor analysis is useful in this connection; to the extent that a test shows high loading on a general factor (g) common to many tests of ability, it satisfies the second criterion. It was hypothesized that Progressive Matrices would have a g loading at least as high as those of the currently-used verbal tests of intelligence.

(c) *Relationship with school success.* A culture-reduced test may not be expected to show very high correlations with school grades, since the latter are themselves weighted by language and

cultural bias. Pupils handicapped on verbal intelligence tests would likewise be expected to display less talent on verbal achievement tests. Nevertheless correlations between the culture-reduced intelligence test and schools marks should be positive and moderately high.

(d) *Reliability.* An important criterion for evaluating any test is the consistency with which it measures. Ability tests for use at the junior high school level should have reliability coefficients close to 0.90.

(e) *Usability.* Such practical considerations as the time required, the training needed to administer the test, pupil interest, and ease of interpretation of results also bear on the extent to which a test is useful in the classroom.

## Description of the Test

The Standard Progressive Matrices Test (1956) is a slightly revised version of a test devised by Raven in 1938. Although it has been used extensively in Britain for military and educational purposes, its use on this continent has been relatively limited. It is a non-verbal test composed of sixty items classified into five sets of twelve, each set being relatively homogeneous in the nature of the principles required in solution. The first problem of each set is easy enough to be self-explanatory, and the progressive increase in difficulty within each set makes the instrument a tester of what it teaches. This characteristic gives the test a certain face validity as a means of measuring learning potential when past acquisitions are held to a minimum.

Most items consist of a matrix or pattern of nine figures, one of which is omitted. The task of the examinee is to choose from six or eight given figures the one which best completes the pattern. This requires the subject first to ascertain the principles underlying the pattern of the main figure, and then to select a completion on the basis of these principles. The two mental processes involved (educing relations and correlates) seem to exemplify, in non-verbal form, the essential characteristics of Spearman's g, while the factor analytic studies which have been performed with the test have tended to confirm this view.

Burke (5) reports that Raven, Vernon, Emmett, Nisbet and Banks have all reported g loadings above 0.78, while American investigators who rotated so as to eliminate a g factor gave the test high loadings on an Inductive or Reasoning factor (17). Apart from an occasional small loading on a spatial factor (18) the Progressive Matrices has not been shown to measure any other group factor of ability.

Reported reliability coefficients differ according to the age and ability of the samples tested and the method of calculation, but typical coefficients for children of junior high school age vary between 0.85 and 0.90. For 120 thirteen-year-old children Raven (16) obtained a re-test reliability coefficient of 0.88. Burks and Sinha, as reported in Burke (5) found an average reliability coefficient of 0.88 when computed by three different methods on a sample of 310 children aged eight to thirteen years.

The potential usefulness of the Matrices can be further seen in cross-cultural researches by Rimoldi (17) and Tuddenham (19), who demonstrated that Argentine and United States children yielded norms similar to those of Raven's Scottish standardization samples. Within a given cultural group correlations with conventional intelligence tests have been reported as 0.86 with the Standford-Binet for 150 children aged six to thirteen years (16), 0.75 with the Wechsler Intelligence Scale for Children for 70 nine and ten-year olds (1), and 0.80 with the Arthur Performance Scale for 23 non-English immigrants to United States (4). On the other hand the mean correlation coefficient with five tests of spatial ability on different samples was less than 0.4 (5). Such results suggest that the Progressive Matrices does sample a comprehensive aspect of intelligence, despite the seemingly specifically perceptual nature of its items.

With educational achievement and verbal group tests of intelligence (both culturally weighted), correlation coefficients are understandably lower. For nine studies listed by Burke (5) the mean correlation with such subjects as arithmetic and English was 0.48. With Intelligence Quotients from verbal groups tests the coefficients typically cluster around 0.5.

The above review suggests that the Standard Progressive Matrices should be useful as a culture-reduced test in situations where Alberta teachers wish to determine the intellectual potential of culturally-handicapped pupils, in order to adapt instruction so as to best realize that potential .(14)

## Collection of Data

*Sample.* After discussion with Edmonton Public School Board officials three city schools were selected for the testing program for this investigation. Since it was desired to choose a sample typical of the Edmonton Grade VII population consideration was given to such factors as academic averages, socioeconomic representation, residential mobility, geographic location, and school type.

To estimate the degree to which the 271 pupils retained in the final sample could in fact be regarded as representative of the then-

current Edmonton Grade VII population, this sample was compared on age, I.Q. (Laycock Mental Ability Test), parental occupation (Blishen Index), and sex, with a random sample of 432 pupils chosen from the 3,600 Edmonton Grade VI pupils who had participated in a city-wide testing program the previous year. This comparison is presented in Table I. Since none of the observed differences between the two samples is significant, the reader is able to generalize the results of this study with a considerable degree of confidence to the population of Grade VII pupils in the schools of the Edmonton Public School Board.

TABLE I

COMPARISON OF GRADE VII SAMPLE WITH RANDOM GRADE VI SAMPLE OF PREVIOUS YEAR FROM EDMONTON POPULATION

| Basis of Comparison | | Sample Gr. VII | Sample Gr. VI | Diff. | t | Signif. | F | Signif. |
|---|---|---|---|---|---|---|---|---|
| | N | 271 | 432 | | | | | |
| Age | Mean | 144.73* | 144.71 | 0.02 | 0.04 | N.S. | | |
| | S.D. | 6.62 | 6.99 | | | | 1.11 | N.S. |
| I.Q. | Mean | 111.64 | 110.41 | 1.23 | 1.18 | N.S. | | |
| | S.D. | 13.24 | 13.57 | | | | 1.05 | N.S. |
| Occupation | Mean | 52.84 | 51.63 | 1.21 | 1.59 | N.S. | | |
| | S.D. | 10.09 | 9.35 | | | | 1.17 | N.S. |
| Sex | Boys | 46.1% | 50.0% | 3.9% | 1.30 | N.S. | | |
| | Girls | 53.9% | 50.0% | 3.9% | 1.30 | N.S. | | |

*Reduced by 12 months.

*Measures.* In May, 1960, the Standard Progressive Matrices was administered with a forty-five minute time limit to all Grade VII classes of the three schools in the sample. Most pupils finished the test in less than thirty-five minutes but extra time was allowed to emphasize the power as opposed to any speed aspect of the test. During the same period the following tests also were administered: IPAT Cattell Test of "g" Scale 2, Lorge-Thorndike Non-Verbal Intelligence Test Level 4, Holzinger-Crowder Uni-Factor Test, and California Short Form Test of Mental Maturity, Elementary.

A questionnaire seeking detailed information on parental occupation and socioeconomic status was administered as well. This latter Home Index scale was similar to one devised by Gough (9); it was adapted for Edmonton conditions after item analysis made on the

basis of results from a pilot study. An occupational score for each pupil was obtained by converting each parental occupation to a scaled score on an index constructed by Blishen (3) from Canadian census data. The correlation between raw score on the Home Index scale and the Occupational Index was 0.61, and since the pattern of correlations between these two indices and twenty-nine other variables examined was very similar (rho = 0.87) it was assumed that the two measures of socioeconomic status were tapping highly similar correlates of mental ability. The results of a factor analysis subsequently substantiated this assumption. Accordingly the two scales were combined with equal weights, and the resulting score regarded as a single measure of socioeconomic status.

Additional measures used included scores on the Laycock Mental Ability Test and the California Achievement Battery Junior High, obtained one year previously, and school marks in basic subjects in Grade VII.

The relevant data were recorded on tape and processed on the L.G.P. 30 electronic computer.

## Results

The Standard Progressive Matrices were examined with reference to each of the five criteria previously outlined.

(a) The extent of cultural loading was investigated by comparing the product-moment correlation between Progressive Matrices and

TABLE II

CORRELATION WITH SOCIOECONOMIC STATUS AND SIGNIFICANCE OF DIFFERENCE IN CORRELATION FOR PROGRESSIVE MATRICES AND VERBAL TESTS

| Test | r with Socioec. St. | Sign. of Diff. from r for Prog. Mat. | |
|---|---|---|---|
| | | t | Signif. |
| Prog. Mat. | .23 | | |
| CTMM Lang. | .41 | 3.27 | Sig. .01 |
| CTMM Total | .38 | 3.07 | Sig. .01 |
| CTMM Verbal | .38 | 2.39 | Sig. .05 |
| Calif. Rdg. Total | .36 | 2.12 | Sig. .05 |
| Laycock | .35 | 2.22 | Sig. .05 |

socioeconomics status with that of the conventional verbal tests administered, using a formula given by McNemar (15) for the situation where two variables are correlated with a common third variable on the same sample. Table II shows the results of this analysis.

The prediction that correlation with socioeconomic status would be lower for Progressive Matrices than for the verbal tests was supported by the differences significant at the .05 level in all instances. (NOTE. Since this paper is focussing on the Standard Progressive Matrices, data for the other culture-reduced tests are not reported here; the interested reader is referred to Elley (8).)

It might be argued that a really "culture-fair" test should have zero correlation with socioeconomic status. However, it has been assumed in this investigation that the combined effects of heredity and early environment, coupled with the cultural influences that operate in any booklet testing situation are sufficient to produce some superiority for children from the upper and middle classes. The significant differences in relationship merely indicates that the discrimination on the basis of socioeconomic status is less marked for the Progressive Matrices. Moreover, Hebb's contention (12) that even the most elementary patterns of perceptual phenomena are learned appears to make the possibility of constructing a test whose media are equally familiar for different cultures somewhat remote.

The lack of loading of Progressive Matrices on either the v:ed or the n factors in Table III provides further evidence of an approach to minimum educational loading for this test.

(b) The extent of meeting the criterion of generality of the abilities sampled by Progressive Matrices was examined by performing a principal components factor analysis on the intercor-

TABLE III

ROTATED FACTOR MATRIX: II-TEST BATTERY

(Loadings below. 20 omitted)

| Test | I g | II v:ed | III n | $h^2$ |
|---|---|---|---|---|
| 1. Prog. Mat. | .78 | ..... | ..... | .63 |
| 2. Cattell | .79 | ..... | ..... | .64 |
| 3. L-Th. N. V. Total | .74 | ..... | .31 | .68 |
| 4. H-C. Fig. Chge. | .52 | ..... | .26 | .37 |
| 5. H-C. Series | .40 | .34 | .53 | .56 |
| 6. CTMM Non-Lang. | .62 | ..... | .35 | .52 |
| 7. CTMM Lang. | .58 | .62 | ..... | .72 |
| 8. Laycock | .63 | .57 | ..... | .73 |
| 9. Calif. Rdg. Total | .44 | .78 | ..... | .82 |
| 10. Calif. Arith. Total | .43 | .51 | .34 | .56 |
| 11. Calif. Eng. Total | .36 | .70 | ..... | .65 |
| Prop. Common Variance | .56 | .33 | .11 | 1.00 |
| Prop. Total Variance | .35 | .21 | .07 | .63 |

relations of the eleven total tests for which scores were obtained. After appropriate iteration for improvement of communality estimates, three significant factors were extracted, and orthogonal rotations were made to maximize the general factor while maintaining a positive mainfold on the group factors. A psychologically compelling solution was obtained after three rotations, and the resulting factors were identified as general intellectual ability g, a verbal-educational factor v:ed, and a numerical ability factor n. The rotated factor matrix is reported in Table III.

Of the culture-reduced tests in the battery Progressive Matrices and the Cattell test best meet the criterion of high loading on a general factor with no loading on group factors, a finding which is supported by many other studies (5) (6). The remaining non-verbal tests show lower loadings on the general factor, and loadings on one or more of the group factors.

Despite the seeming specificity of the function measured, it can be concluded that the Standard Progressive Matrices is sampling a broad aspect of ability common to a wide variety of intelligence and achievement tests.

(c) Relationships with school achievement were investigated by correlating Progressive Matrices with results from teacher-made and standardized tests. This type of "cold-blooded" predictive validity is a less suitable evaluative standard for this investigation since the criterion of school achievement is also culturally weighted. Only when special remedial treatment had been carried out or cultural differences held constant would predictive or concurrent validity in terms of school marks be crucial. However, the effects of cultural weighting are not so great that a culture-reduced test is relieved of the necessity for showing a reasonably high relationship with school marks, which do reflect some measure of intelligence.

The school mark used as a criterion was the average of those recorded on end-of-year report cards in Grade VII, based on equal weights for reading, literature, language, social studies, science, mathematics, art, music, health and personal development, and industrial arts or home economics. Since somewhat different bases were used for calculating end-of-year marks for the various classes, correlations were calculated for the thirteen classes separately, and median correlations are reported here. Selected intelligence test scores were also correlated with the scores on the California Reading, Arithmetic, and English tests administered twelve months previously. Results are reported in Table IV.

As anticipated Table IV indicates some superiority for the culturally-weighted verbal tests in predicting school marks and achievement test scores, which themselves, under the relatively fixed treat-

TABLE IV

CORRELATION OF SELECTED INTELLIGENCE TESTS WITH SCHOOL MARKS AND ACHIEVEMENT TESTS

| | School Mks. | Calif. Rdg. | Calif. Arith. | Calif. Eng. |
|---|---|---|---|---|
| Prog. Mat. | .56 | .43 | .44 | .38 |
| CTMM Lang. | .67 | .77 | .56 | .62 |
| CTMM Total | .66 | .72 | .60 | .61 |
| Laycock | .59 | .71 | .55 | .64 |

ment of ordinary curricula, can be expected to reflect cultural influence. But it can be concluded that Progressive Matrices shows a sufficiently high relationship with school marks to indicate that it samples an important aspect of the ability to do well at school.

(d) Further evidence on the reliability of Progressive Matrices was obtained in the form of a split-half reliability coefficient of 0.91 and a Kuder-Richardson coefficient of 0.83, over the 271 cases of this sample. The median value of 0.87 is close to that reported in similar studies; it can be noted that this sample was relatively homogeneous.

(e) One of the advantages of Progressive Matrices is the ease with which it can be administered to groups. The low difficulty level of the first items greatly simplifies the few manual directions, and some success has been achieved in administering the Coloured form without verbal instructions. The unusual nature of the tests and the intrinsic appeal of the problems makes test motivation an easy task, while the lack of time limit removes another possible source of error in administration. Of the tests administered in this study, Progressive Matrices attracted the most interest among pupils and teachers.

Scoring of the tests is easily performed by means of a strip key. The percentile norms provided by Raven are based on a sample of 1,400 Scottish children, and it may be questioned whether they are appropriate for their Canadian counterparts. Raven's percentile norms for thirteen-year-olds are similar to the scores of the Edmonton sample in the upper fifty per cent, but discrepancies become more marked in the lower score ranges. The comparative studies of Rimoldi and Tuddenham, cited earlier, suggest that the manual norms are useful, if not exact, for other national groups. There is an apparent need for a normative study on a representative Canadian sample in order to increase the utility of the test.

(f) Valuable information concerning the comparative longer-term stability and predictive validity of Progressive Matrices and the

California Test of Mental Maturity was provided by the records of the 243 cases from this Grade VII sample who had taken earlier versions of these two tests in 1956, when these pupils were in Grade III. Table V suggests that in stability and long-term prediction of school marks, Progressive Matrices is at least as good as the California Test of Mental Maturity.

TABLE V

CORRELATIONS OF TESTS ADMINISTERED IN 1956 WITH SCHOOL MARKS AND LATER VERSIONS OF THESE TESTS ADMINISTERED IN 1960

(N =243)

| Gr. III—1956 | Gr. VII—1960 | | | | |
|---|---|---|---|---|---|
| | Schl. Mks. | Prog. Mat. | CTMM Lang. | CTMM Total | CTMM Verbal |
| Prog. Mat | .35 | .55 | | | |
| CTMM Lang. | .31 | | .49 | | |
| CTMM Total | .39 | | | .47 | |
| CTMM Verbal | .19 | | | | .22 |

## Summary, Conclusions, and Implications

This paper examines, for a representative sample of 271 Edmonton Grade VII pupils, the extent to which the Standard Progressive Matrices meets several criteria established for a culture-reduced test of general intellectual ability. It was found that the Standard Progressive Matrices:

(a) had significantly less correlation with socioeconomic status than did the conventional verbal intelligence tests with which it was compared;

(b) had a high loading of 0.78 on the general intellectual ability factor and no loading on the group factors emerging from a factor analysis of a battery of ability tests;

(c) had moderate relationship with school marks and school achievement;

(d) had a reliability coefficient of 0.87;

(e) was interesting and easily usable as a group test, although Canadian norms would be desirable;

(f) over the four-year period from Grade III to Grade VII was as stable and as predictive of school marks as was the California Test of Mental Maturity.

The foregoing evidence strongly indicates that the Standard Progressive Matrices can make a very useful contribution to the better understanding of the abilities of urban junior high school pupils from lower socioeconomic strata, who may be unable to adequately demonstrate their intellectual potential on conventional verbal tests of intelligence. It also indicates a need for establishing Canadian norms for this test, and pending such action, for the establishment of norms for local areas.

Further investigation of this test as a measure of general intellectual ability having minimum cultural loading for such groups as those with foreign language background, rural children, poor readers, Indians, and Metis, is warranted. Several such studies are under way and will be reported at a later date.

On the basis of the present studies, the Standard Progressive Matrices can be recommended as likely to be most useful to teachers, counsellors, and administrators in the following specific situations:

(1) Identification of talented pupils from underprivileged backgrounds, predominately slum areas, isolated rural districts, and situations where a child has had little formal schooling.

(2) Classification of pupils who, because of foreign language background, are not able to demonstrate their best on a verbal test.

(3) Diagnosis of difficulties in basic tool subjects in helping to determine whether retardation can be attributed primarily to mental defect or to some correctable handicap of a sensory, emotional, or environmental nature.

(4) Obtaining more accurate levels of expectation for the school achievement of pupils who are handicapped on conventional verbal intelligence tests.

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## BOOK REVIEW

*Studies in Spelling* The Scottish Council for Research in Education. London, University of London Press Ltd. 1961.

The Scottish Council for Research in Education have complemented their previous publications in the basic subjects of the elementary school, *Studies in Arithmetic* and *Studies in Reading,* with a volume *Studies in Spelling.* The panel which investigated problems of teaching spelling was first confronted with the question, "what are the words which children in the primary school should be able to spell?" A spelling list for Scottish children based on their needs and interests was obtained from the analysis of 69,740 compositions on a variety of topics from a representative sampling of Scottish school children aged seven to twelve. This list has been published separately as *The Scottish Pupil's Spelling Book,* and the main purpose of the current volume is to explain the method by which the compositions were obtained and the list derived.

Much of the criticism levelled against many investigations of this type has been that either the topics or sampling have circumscribed the words used by the children. The panel attempted to overcome this by having sixty-eight topics covering many aspects of child experience, including physical, intellectual, aesthetic, recreational, vocational, and a general category of extra-curricular activities. In attempting to allocate words used to particular class (grade) levels, it was essential to ascertain the comparative popularity of the topics at each level. An index of popularity was derived for this purpose. Criteria for selection of words were categorized, the main criterion being frequency of misspelling at a particular class level.

There has been a plethora of research in spelling almost equal to that in the field of reading. In this volume the research in spelling is reviewed under four headings:

(1) Spelling vocabulary—the discovery of words most commonly used in writing.

(2) Grading of vocabulary—determination of the content, arrangement and sequence of the spelling tasks among the several class levels.

(3) Development of better instruments for the measurement of spelling ability and diagnosis of errors.

(4) The teaching of spelling.

One aspect of the problem of teaching spelling which is frequently overlooked, and is ignored in this overview, is the nature

of the perceptual task involved and type of associative learning necessary in accurate spelling. Some research has been carried out in this area in recent years which indicates methods might be developed to assist the problem of individual differences. This might help to overcome also the frequent criticism that the amount of time spent in school is not justified by the general results obtained.

Summaries of three theses on spelling, "A Study of Spelling Errors", "Rules in Teaching Spelling", and "Do Spelling Books Teach Spelling?", are also presented. Though the populations used in all cases were small, the results of the experiments tend to confirm those of similar studies in the United States. No indication is given as to the date at which these studies were undertaken. An examination of the references in each of the three abstracts reveals none later than 1939 and the majority based on research in the first thirty years of this century. It is a pity that a book issued in 1961 should take into account so little of the research in spelling published in the last twenty years. A conservative estimate (taken from the references of the three volumes of the *Encyclopedia of Educational Research*) is six hundred reported research studies since 1940.

The two remaining chapters entitled "Notes for Scottish Teachers on English Spelling", and "A New Approach to the Simplification of Spelling", are of general interest. The first is a brief but excellent discussion of the etiology of the vagaries of spelling in the English language. The writer illustrates the elaborate series of conventions that have determined current spelling, and emphasizes that "the uniformity of modern spelling conceals considerable diversity in the pronunciation of words, a diversity caused by the social, psychological, educational and geographical differences". Material found in this chapter is not readily available to teachers and could be used to interest pupils in word derivations and etymological and orthographical changes. The final chapter is another version of the popular academic pastime of attempting to find a logical solution to spelling irregularities. The author suggests no new symbols but indicates changes which could be made to regularize present spelling and bring it closer to current pronunciation. While the suggestions appear to be more feasible than most, they do not take into account the present diversity of pronunciation differences suggested earlier or the problem of future changes.

The difficulties faced by any learner in writing the English language cannot be underestimated, and anyone interested in the attempt to find the most effective means of teaching spelling should include *Studies in Spelling* and the companion pupil's book, *The Scottish Pupil's Spelling Book,* on their booklist.

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